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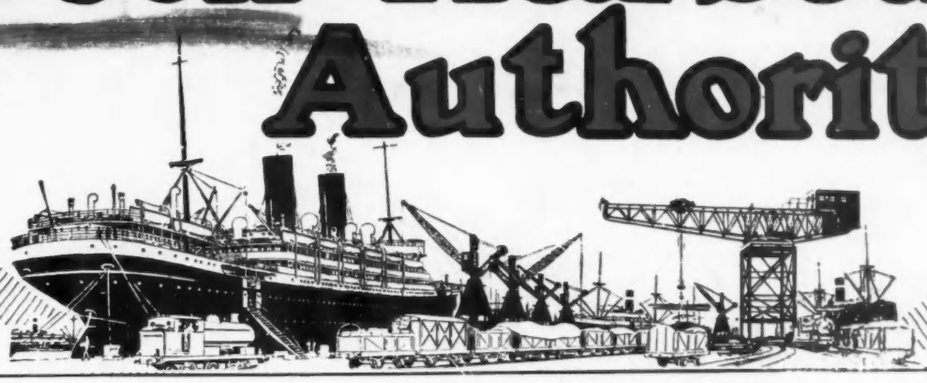

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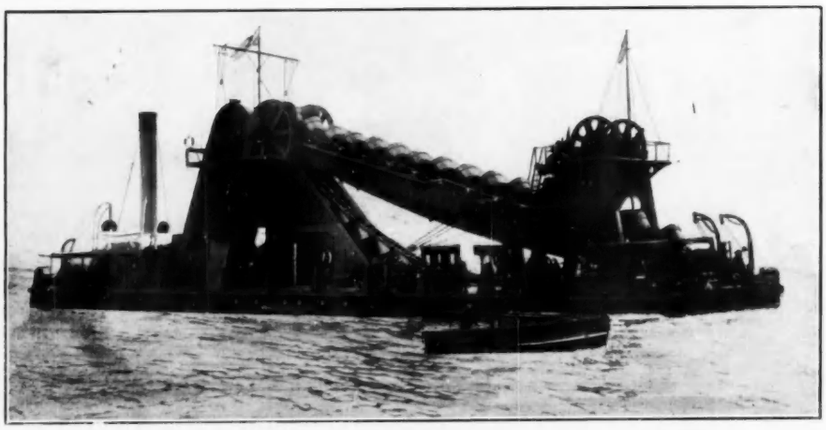

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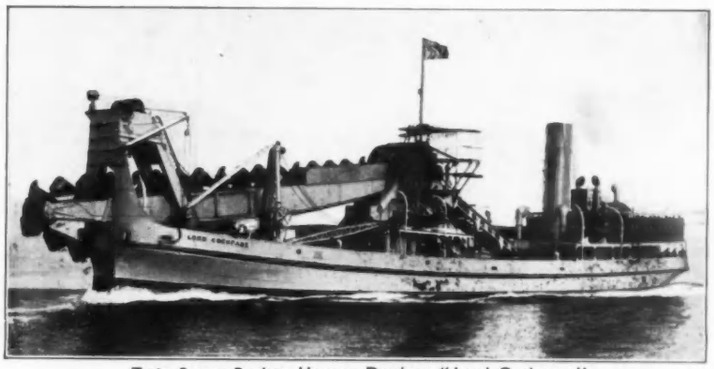

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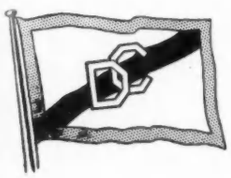

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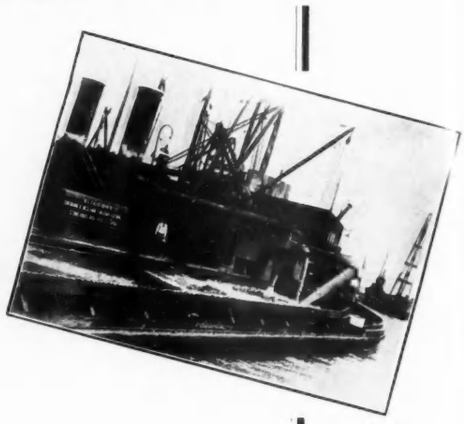

Fig. 2

The foreshore was dredged as shown in Fig. 1, and the dredgings barged to a floating pump station (Fig. 2), which pumped out the dredgings and forced the material through a 24-in. pipe laid alongside the railway line, under which it passed as shown in Figs. 3 and 4.

The material which consisted of sand, mud, clay and ballast, was finally discharged into a water area (Fig. 5) which has been reclaimed for extension purposes. The total length of the discharge pipe was about half-a-mile.

Fig. 3.

Fig. 4

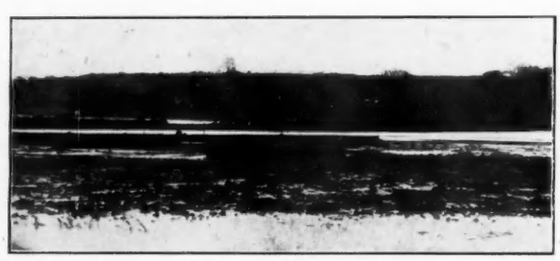

Fig. 5

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The Dock and Harbour Authority

No. 258. Vol. XXII. Edited by BRYSSON CUNNINGHAM, D.Sc. B.E., F.R.S.E., M.Inst.C.E. APRIL, 1942

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Editorial Comments

Leixoes Harbour Works.

Readers of this Journal will be able to recall that in the issue for July, 1939, there was published an important article on the Extension of the North Mole at Leixoes Harbour, Portugal, from the pen of Senhor Duarte Abecasis, Engineer in charge of the undertaking. It explained how, in consequence of the serious damage caused to the work by the storms which occurred in the winter season of 1934-35, during which an outer length of 120 metres was practically destroyed, it was decided by the authorities to revise the design of the breakwater in the direction of the type of mound successfully adopted at Casablanca, and particulars were given of the experimental investigation on scale models carried out by Professor Stuky in the laboratories of the Engineering School at Lausanne University in order to determine the best type of structure for adoption in the proposed extension of the Mole for a length of 1,000 metres.

In the intervening period considerable progress has been made with the undertaking, which is now nearly, if not quite, completed and we are happy to be able to include in the present issue a recent report by Senhor Abecasis dealing with the protection of the breakwater mound by the deposition on the outer slopes of massive concrete blocks, weighing 90 tons each. These blocks are of a somewhat unusual shape, resembling enormous dice with chamfered corners, so that they readily fall or roll into gaps in the rockwork surface of the slopes. Another interesting feature is the method of deposition which was employed. A special barge, or lighter, was constructed with an overhanging and strongly-built prow. It will be seen from the report that the blocks, in series of six, were successively tipped, or launched, from the prow and allowed to bed themselves under the influence of their own weight and the action of the sea.

Several questions suggest themselves as to the reaction of the barge after each launching, and its stability under considerable variations of load and trim, but apparently no serious difficulty was encountered and the operation was carried out successfully. The shape of the blocks, too, which approaches closely to the spherical, might seem at first sight to be conducive to dislocation under heavy wave impact, and it would be interesting if, at some future date after the experience of several winter storms, Senhor Abecasis would favour this Journal with his observations on the ascertained behaviour of the blocks and the efficiency of the protection given to the mound surface. From the particulars recorded of seas encountered at the entrance to the harbour, which has the reputation of being in an exceptionally exposed situation, there is evidence of powerful wave stroke, which will probably test to the full the steadiness and stability of the blocks.

Our readers will appreciate the enterprise and originality shown by Portuguese harbour engineers in dealing with a very difficult problem.

Quayside Labour Delinquencies.

A considerable amount of acrimony continues to prevail in reports in the press in respect of the quayside labour controversy. On the one hand, there are allegations of frequent absenteeism, slackness and indifference, and on the other, indignant repudiation of any charges reflecting on the spirit and efficiency of the workers. Protagonists on both sides have used strong, and sometimes heated, language; but without an intimate knowledge of all the local conditions, it would be difficult to assess the position and arrive at a fair and unbiased judgment.

A South Shields seaman, lately returned from a voyage to Russia, is reported to have made a disquietingly unfavourable comparison between the methods of Russian and Scottish ports His ship, it is stated, loaded at a Scottish port and took eight days for the operation. Delay, he alleges, was caused by the dockers going on strike because " they decided that one bag of sugar was too heavy for two men to shift." They refused to work until they obtained another man. In Russia, where the discharging facilities were anything but ideal, and where there were no quay cranes, the local garrison, using the ship's derricks, worked 12 hour shifts and finished the job of unloading in 48 hours.

The Industrial Correspondent of a leading London Journal has stated that on a recent occasion, he watched 30 men stand idle awaiting railway tracks to draw alongside a ship, and after the trucks had been loaded, there was further shunting delay caused by three in-and-out movements of the wagons for coupling purposes. The men were kept waiting for fresh trucks and passed the time in making ribald remarks about the shunter.

These are, of course, isolated instances and there is no definite evidence (notwithstanding other cases adduced) that they were typical of the industry as a whole. Alderman Simon Mahon, Merseyside Area Secretary of the Transport and General Worker's Union has taken up the cudgels on behalf of the men in his district and asserts that "actually work is rarely held up at all. Since the war began, there have been only three minor stoppages of work on the Liverpool docks. Sickness and domestic troubles cause some absenteeism and there are many elderly men incapable of doing a full week's work." This last admission seriously compromises the case of the dockers. A man unfit for military duty is discharged from the army. In the present critical state of affairs when every dock worker is a virtual fighter, no man who is physically incapable of carrying out his duties should be engaged on so vital a task as cargo-handling. Stern necessity demands a full week's output from every hand engaged on ship-loading and discharging.

But it is unfair to lay all the blame on the elderly and incapable. Delinquents are to be found in the ranks of the lusty and able-bodied, some of whom are definitely lazy and "work-shy." The Regional Port Director for the North-Western Area, in his magazine *The Hook*, instances cases of men called up for interview "few of whom had done more than seven half day turns in a week—3½ days work per week for a grown man on vital work in a country at war! And several of them had put in their seven turns by night and week-end work, when pay is highest."

That there is a real body of seriously minded, capable and energetic workers will be freely admitted. Unfortunately there is also a minority—let us hope it is small in numbers—who bring discredit on their calling and on their comrades by their despicable conduct.

Editorial Comments—continued

Canadian Inland Waterways

The Annual Report of the Canadian Department of Transport for the fiscal year ended 31st March, 1941, which has just been received, contains statements of the operations carried out by the various services of the Ministry during the year in question, with the expenditures respectively incurred. Included is a review of the progress made on the important waterway development scheme, the widening and deepening of the River St. Lawrence Ship Channel to provide a depth of 35-ft. at extreme low water, which, in conjunction with the extension of the channel westwards along the international boundary between Canada and the United States as far as Lake Ontario, will eventually become an undertaking of outstanding magnitude. Excerpts from the report of the Chief Engineer of the Ship Canal are given elsewhere in this issue.

As regards the internal canal system of the Dominion, the sectional report states that war conditions had a marked effect on canal traffic in 1940. Increased war manufacturing in the Great Lakes region, calling for greater movement of oil and coal in Southern Ontario, more than compensated for the reduction in grain shipment, with the result that the freight carried on the Welland Canals was about 10 per cent greater than in 1939, while through the Sault Ste. Marie Canals, the increase was over 28 per cent. The pronounced decrease in grain exports by way of the Great Lakes was the main factor in causing a decrease of 12 per cent in the freight carried through the St. Lawrence Canals.

Quayside Aerial Ropeways

It may be expected that the attention of our readers, especially those who are occupied with loading problems at the quayside, will be attracted to the article in this issue by Mr. Harrison Roe on the use of ropeways adjacent to the waterside for the handling of appropriate material either into craft or to shore. Although adopted to an appreciable extent on the Continent for the conveyance of ore and minerals, particularly in cases where considerable heights have to be negotiated, as, for instance, in loading ironstone from quarries in a mountain side, the number of examples to be found in this country is not impressive. There is certainly notable installation at Dover, connecting the harbour with the Tilmanstone Colliery, which lies at a distance of over 7 miles inland, and we are familiar with, at least, one other example, though of less importance, in the Thames Estuary. But with the exception of these and some others, waterside ropeways are not so well represented in this country as they might be and they cannot be said to have attracted the degree of notice to which the utility of the method would appear to be entitled. There are good grounds on which the trading and manufacturing communities might investigate the merits of this form of shipment in comparison with its alternatives.

It is true that there are certain obvious limitations. The system lacks the continuity, and to some extent the speed of the conveyor belt, while railway wagons can convey loads of much greater calibre. On the other hand, in regard to absorption of space at the quayside for storage of material in transit, the ropeway offers important advantages. It is not contended that ropeways are universally applicable, but there are clearly circumstances in which their installation would prove economical and effective; these are set out in the article above referred to, with a number of illustrative examples.

There comes an appropriate rider to the article and the foregoing remarks in the recent announcement of the placing of a contract by a mining concern in Sweden for the erection of a cable and suspension railway which will be over 60 miles long and the longest in Europe. The cost is estimated at twelve and a half million kroner.

The Prime Minister's Appeal

At the close of last month, too late for notice in the March issue of this Journal, a conference of employees and workers in the port transport industry was held in London. The Prime Minister sent a special message of personal appeal for greater efforts to speed up the turn-round of ships in port. "Every day that is saved in the ports represents a solid addition to our merchant fleet," he said, adding "there can only be one aim—to get the ships out to sea again quicker than ever before."

Lord Leathers, Minister of War Transport, presided at the Conference, which was addressed by Mr. Bevin, Minister of Labour. No detailed information has been vouchsafed as to the nature and scope of the discussions, but an official statement was issued stating that many points were raised and suggestions made with a view to expediting operation at the docks. At the close, the following reply was sent to Mr. Churchill: "We will all do our utmost to speed the turn-round of ships and thereby hasten victory."

On which we venture to comment that it is not merely a question of hastening victory. The country is in the grip of a life and death struggle, in which all matters of personal advantage, profit and interest and all disputes about wages, trade privileges and port customs must be flung aside, until it has been decided whether the nation is to go under in ignominy and shame, or whether it will survive as the virile progeny of forefathers who built up a great and glorious empire.

The Shipping Outlook.

Port officials are naturally concerned in the welfare of the shipping industry. Unfortunately, the latest Annual Report just issued by the Chamber of Shipping in the United Kingdom does not present a very cheerful account of the present position, nor of the future outlook, of the British Mercantile Marine. The total of British, Allied and neutral vessels officially reported as lost up to the end of June last year, when publication of losses was discontinued, amounted to 7,103,980 gross tons, and since that time until the close of 1941, it is estimated by the Chamber of Shipping that rather more than another million tons has disappeared from the seas, making a combined loss of about 8,300,000 tons, or, if merchant ships used as naval auxiliaries be included, of about 8,600,000 tons.

The replacement of so huge a volume of shipping will require not only strenuous and unremitting exertions, but also a long period of time, even allowing for the substantial contributions which are now forthcoming from American yards. At present, American shipbuilders are concentrating on the production of moderately sized cargo vessels of a simple type, such as have been turned out in this country for several years. Obviously the gigantic "luxury liner" is a thing of the past, and strict utility, with the utmost possible carrying capacity, must be the governing consideration for the immediate future. The effect on standards of port accommodation will undoubtedly be marked and, possibly, far reaching.

With a reduction in the calibre of vessels and the absence of mammoth ships, authorities at the major ports, should not, in future, be called upon to provide exceptional and costly installations, such as graving docks and entrance locks of outstanding dimensions, which are so rarely used to the full extent of their capacity. The matter is one which may well engage the attention of dock engineers at the present time, in collaboration with naval architects and shipbuilders, with a view to determining in advance the probable standard of accommodation which will be requisite in the near future.

Port Charges.

The significance of certain announcement which appeared in the press in mid-March can scarcely be over-rated by the general public nor should their implications be idly ignored. The Port of London Authority have notified a number of alterations and additions in their schedule of rates and charges for discharging vessels and other services, and on import goods and goods for shipment, which came into force as from March 18th in consequence of the introduction of the Dock Labour Scheme for the port under the Essential Work (Dock Labour) Order, 1941. The increases range upwards from 27½ per cent. to 75 or 80 per cent. above the original schedule.

On the same grounds, the London Association of Public Wharfingers and the Association of Master Lightermen and Barge Owners have announced similar increases in their respective charges. The authorities and associations at other ports have already taken the same step or will follow suit. And it has to be recognised that all these increments will necessarily be passed on to the consumer in the prices of the goods themselves when they come to be purchased in the shops.

Slowly but surely, the upward trend in the cost of living continues, and the vicious spiral of wages and prices mounts ever higher without let or hindrance. The wage-earning class pursue an elusive standard of remuneration which can never satisfy their aspirations while those unfortunate individuals whose incomes are stationary or falling, find their circumstances becoming daily more straitened. The "equality of sacrifice" for all, so sedulously preached, has become a mockery and a bye-word for cynics. No one is satisfied and no one the happier.

Merseyside Labour Zoning Scheme.

Under a new scheme introduced by the North-West Regional Port Director, the dock labourers on Merseyside are having an opportunity of putting their zeal and integrity to the test. Zones have been created in which men can elect to serve as they wish and they are given the privilege of disciplining themselves, suspensions and other punishments remaining in abeyance for such time as the experiment works successfully. The men must deal in their own way with slackers and defaulters. The result of the experiment will be watched with much interest.

Indeed, there are implications in the experiment which may cause a certain degree of misgiving. The men in H.M. Forces are subject to discipline which takes no account of their personal preferences and dislikes as to the nature of their duties they are called upon to undertake. That they perform these duties readily and cheerfully is greatly to their credit, but it is obvious that the extension of the voluntary principle to the forces would result in chaos. Seeing that all labour on work of national importance is equally essential to the safety of the State, it does not seem equitable—nor altogether wise—to differentiate the method of treatment

The Harbour of Leixoes (Oporto), Portugal

Construction of the Extension of the North Mole*

By DUARTE ABECASIS,
Engineering Director-General of the Port.

Basic Considerations

THE experiments made with reduced scale models in the laboratory at Lausanne as described in the Annual Report for the year 1937 demonstrated:

1. That the stability of the adopted sectional profile, which was amply secure, was conditioned by the sound execution of the protective layer of large artificial blocks; and
2. That the protective effect of the work would be the more enhanced as the height is increased, as, indeed, is obvious, it being justifiable to consider it already very critical as regards the navigable channel in the entrance of the harbour during periods of low tide, with the crest level as provided in the design.

The first of these conclusions caused the official control, which had been entrusted to the Technical Direction of the Ports of Douro and Leixoes, to lay down special requirements as regards density and proper arrangement of the revetment of 90-ton artificial blocks, realising the fact as they did shortly after the commencement of the work, that the floating craft, ordinarily used for the deposition of the blocks, could not achieve results which would satisfy these requirements.

This circumstance led the contracting firm to investigate a new type of floating plant for the launching of the blocks which would allow as compact an arrangement as possible, with the same sound execution of the bedding at a higher level, and moreover, would facilitate the increased output which was necessary for the accomplishment of the undertaking within the stipulated time.

The firm were able to solve the problem very fortunately by pursuing the studies with small scale models for the pontoon *Marieta*, which, since then, has been in service and embodying a strong cantilever projection at its extremity, has been able not only to command in its entirety the mound to be constructed, but also to attain therewith an appreciably greater height than that allowed for in the design.

On the other hand, the moderate slope of the mound combined with a practical horizontality of bedding in the blocks, enabled a remarkable regularity to be obtained in the arrangement of the work, which is further facilitated by the cubical shape of the blocks with their corners substantially chamfered.

Finally, the size of the blocks, permitting of the simultaneous transport of six blocks and their speedy launching in close succession helped to achieve an increased rate in the process.

All these fundamental features of constructional possibility in the alteration of the section of the work as regards its elevations were indicated by the aforesaid convenient tests, of which the Directorate General resolved to take advantage forthwith.

Allowance for Settlement

In dealing with a work which comprised a substantial mass of rock rubble, there had to be taken into account, as was done in the design, the possibility of appreciable subsidence. This involved the obligation to adopt a constructional profile, with which, at the level of the crest of the rock rubble, a super-elevation would be given relative to the finished design, so as to allow for settlement and penetration.

In order that the super-elevation accruing at the summit of the protective layer of artificial blocks might be accompanied by a corresponding flattening of the side slopes which the experiments showed to be an essential condition for stability, particularly in the upper part of the section, an additional height of two metres was given to the crest of the mound in the central portion, 14 metres in width, bringing it thus to the level of—6 metres, in order to preserve the original crest level at—8 metres.

This outline constituted, both in the mound and in the revetment of artificial blocks, the central raised portion fixed in accordance with the lower part of the sectional profile for slopes flatter than 4 to 1.

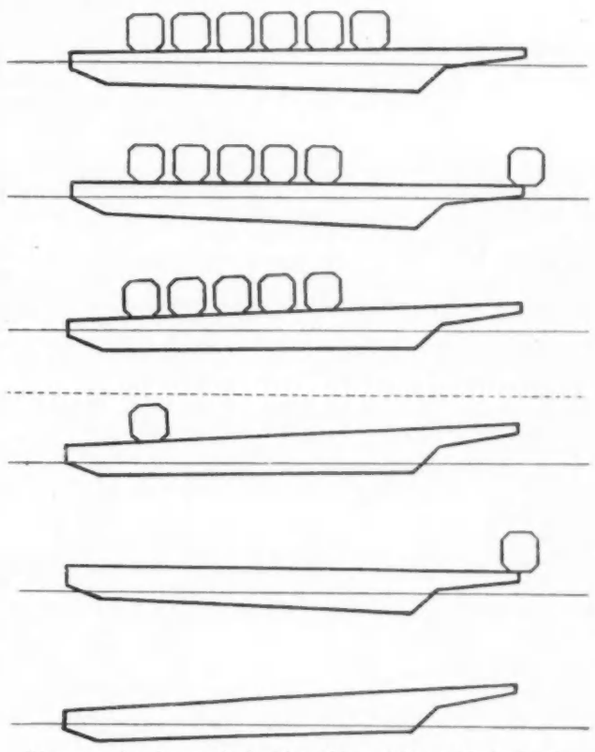
The outline adopted for the constructional profile in the memorandum, dated 31st March, 1939, of the Director-General is represented in the accompanying diagram entitled "Section as Designed."

As it is not possible in seas so agitated as those at Leixoes to adhere rigorously to a fixed design, nor, on the other hand, to estimate correctly the degree of perfection obtainable by constructional plant, never, perhaps, falling into exact accord with prescribed plans, an average profile was adopted, designated "Section as Executed," which is also represented in a diagram.

In this profile, the levels reached by the more outstanding protective blocks were at times higher than +2 metres, even reaching +3 metres, which demonstrates the excellence of the pontoon-bridge system for launching blocks to reach higher levels.

After a year to eighteen months' exposure in the sea, no deformation whatever of the profile has been observed beyond a normal settlement, less than that anticipated which led to the "Section after Settlement" represented in the third diagram.

This bedded profile underwent attack by violent storms, among them those of the 14th to the 17th November, 1940, with waves, the maximum amplitude of which was estimated at 7m. 50, thus proving the pre-vision of the author as to the great economy of maintenance of the type of work proposed.



Diagrams showing method of launching of 90-ton blocks by the floating craft "Marieta."

For the time being, the work of construction at the mole is practically concluded, having regard to the fact that the whole structure of rock work and revetment of artificial blocks only lacks a length of 100 metres to complete the extension of 1,000 metres of mole.

There remains to be settled in the project, the solution to be adopted for the beaconage and for the lighting of the mole head. This is to be accomplished by means of a lighthouse with an illuminant fixed at a height of +20 metres, installed in a tower of reinforced concrete, bedded at the level of +10 metres in a circular mass of concrete about 18m 50 in diameter, constructed from the level of +5 metres, with the filling of a great caisson of reinforced concrete of that diameter resting upon the summit of the mole head foundation, levelled at—6 metres and protected on the outside by a mass of 90-ton blocks deposited pell mell.

Results of the Shelter Provided by the Work: Reduction in Wave Amplitude

The effects of the shelter produced by the breakwater in the interior of the harbour began to be felt immediately after the initiation of the rubble mound development, when it had been brought to the level of—6 metres, which constituted the nucleus of the work.

*Translated from the Portuguese. Extracted from a Report of the Maritime Department in the 1939 Annual Report of the Portuguese Hydraulic Services. Leixoes Harbour works were described in an article by Senhor Abecasis in the issue of "The Dock and Harbour Authority" for July, 1939.

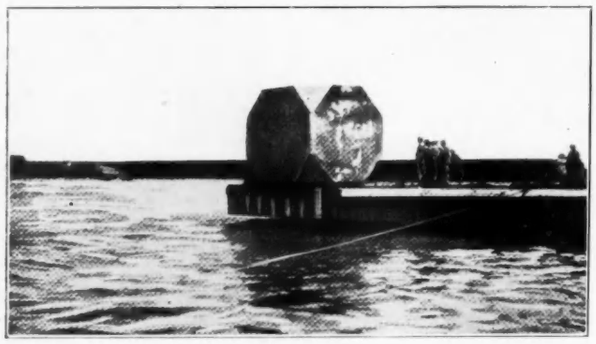
Harbour of Leixoes, Portugal—continued

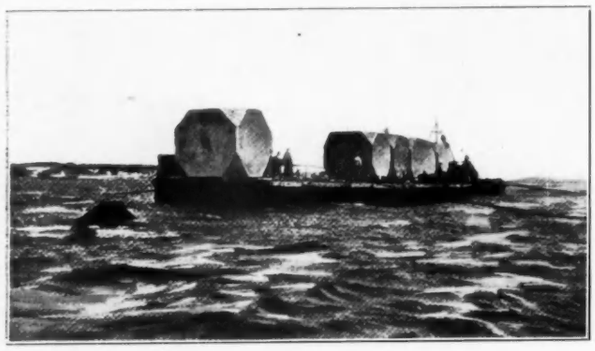
They made themselves manifest to master mariners frequenting the port, as also to the contractor for the construction of the inner dock, who had been accustomed to see the interior of the excavation compartment invaded by waves which swamped an external dam in times of storm.

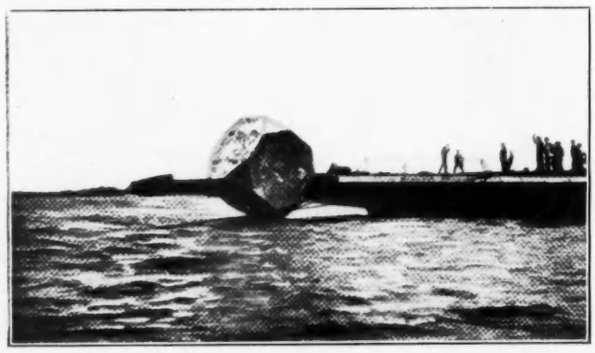
As regards this part of the harbour area, it is sufficient to say that following the removal of the protective dam, there is complete tranquillity in times of storm.

With respect to the protection obtained in the basin, or outer harbour, in the entrance, in the navigable channel exterior thereto and at the South Mole, previously built, for which the cost of maintenance in 1937 and 1938 amounted to more than 5,000 contos, excellent testimony is afforded by the report of the Technical Direction of the Ports of Douro and Leixoes relating to the storm, before mentioned, of November, 1940, as follows:—

" After several days of disturbance there arose on the 16th and 17th of this month, a storm which violently assailed the exterior works of the harbour.







Views of the launching of 90-ton blocks from the "Marieta."

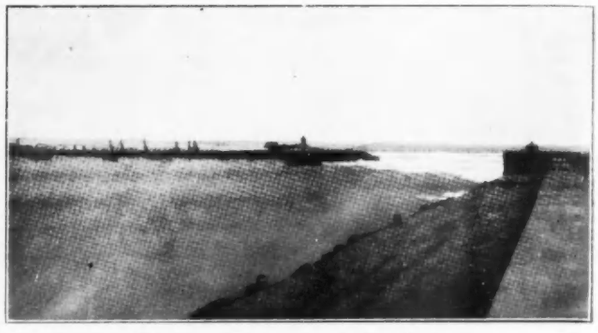
" There were recorded on each side of the breakwater certain wave measurements which have been brought to the notice of Your Excellency, accompanied by photographs and by a brief description of the behaviour of the moles, particularly of the breakwater, the tranquillising effect of which was placed in evidence for the first time.

" **South Mole.**—This mole was relatively protected by the shelter of the external work or outlier. After passing the breakwater, the waves, on reaching the substantial blockwork defence of the mole, had their amplitude greatly reduced and several times the surf broke over the crest of the mole.

" **North Mole.**—Over this mole the sea broke with great violence but without causing any damage. Commencing this year, opportunity has been taken to relay on the slopes the defence blocks which had almost disappeared.

" **Breakwater.**—The revetment of 90-ton blocks having been almost completed, it was possible to a considerable extent to observe the effect of the work in deadening wave action.

" During the period in which the storm was at its worst (on the 16th) there could be observed from the extremity of the old North mole the breaking and progress of waves from the W.N.W. towards the interior. It was not possible at any time to take measurements of the height of the waves. Rain fell heavily and visibility was bad. As already stated, the squalls of rain, and above all, the spray over the immersed section of the breakwater,



Entrance and Interior of the Harbour.

caused by a wind with a velocity of 72 kilometres per hour constantly covered with moisture the lenses at the binocular station. But from visual comparison with the heights which were measured from the same point on the evening before, it was possible to assign to the waves on this occasion an amplitude of 7m. 50. It was also agreed from observations in the meanwhile, that several had a slight super-elevation of the wave crest due to the wind.

" These waves broke forcibly over the outer works, which they encountered almost entirely submerged. The height of the tide at this time (2 p.m.) was 2m. 90 as compared with 3m. 27 at 3.40 p.m.

" After breaking, the wave propagated itself with rapidly decreasing altitude. On making contact with the mole pierhead, it broke again over it with much reduced violence. Its amplitude at the harbour entrance should have been on this occasion about 3 metres and the length appreciably short—50 to 70 metres. About one or two hundred metres inside the entrance the undulation disappeared in the general turmoil of the harbour caused by the wind. An idea of the relative quietude of the interior may be gained from the fact of its having been possible to take up a position with the official motor launch, after having crossed the waves, at less than 100 metres from the line of the mole pierheads, and further from the fact that craft were kept moored quite close to the entrance. In particular, some of them anchored some 10 metres from the head of the South Mole.

" The outer channel clearly did not possess the tranquillity of the harbour and it was not possible for small craft to traverse it. The harbour was cut off but protected.

" The steamer *Hannah* which had berthed at the breakwater on 23rd October was destroyed in consequence of the storm. At low water on the 17th November only the wreckage remained visible.

Storm Waves at Leixoes Harbour at mid-day on 17th November, 1940.

Two conjoined photographs which are not simultaneous, nor do they correspond to two phases of the same wave. They have been combined merely to show the process of the breaking of the waves.

The following are some indications of wave amplitude observed during the period, 14th to 17th:—

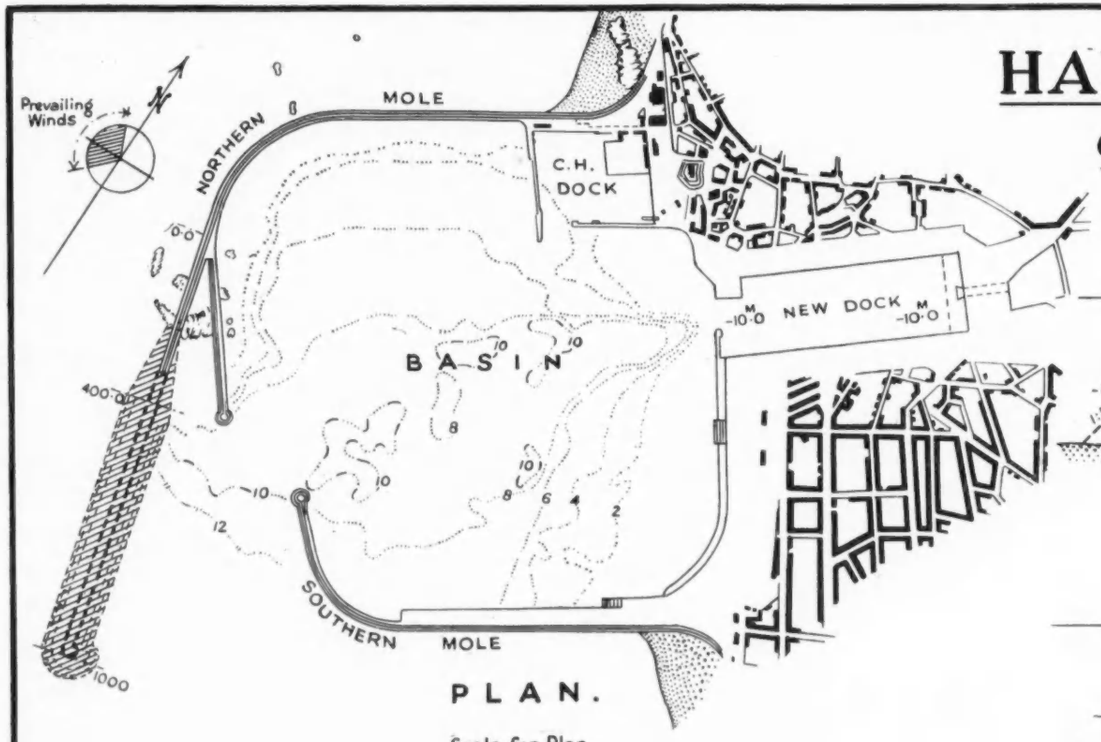
On the 14th at 3.50 p.m.: height of tide, 3 metres; wind N.W., 10 kilometres per hour:—

2h. = 6m. 50

Maximum amplitude, determined by binoculars, gauged by the vertical disturbance of a buoy located 80 metres outside the breakwater.

HARBOUR OF LEIXÕES

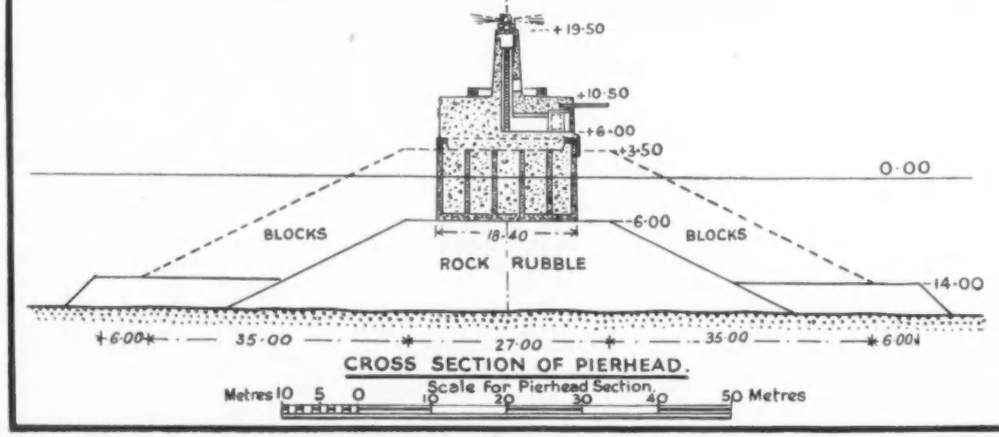
OUTER DEFENCE WORK



PLAN.

Scale for Plan.

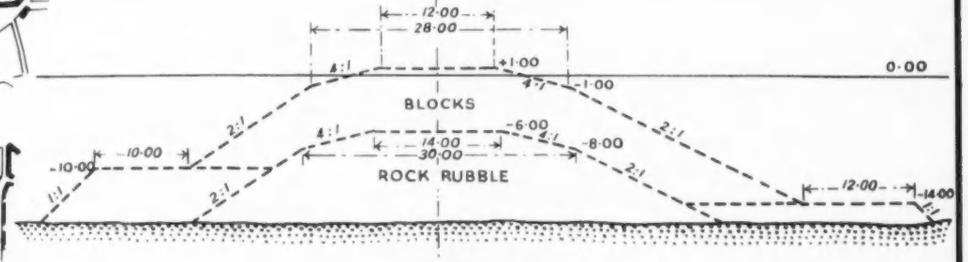
Metres 100 50 0 100 200 300 400 500 600 700 800 900 1000 Metres



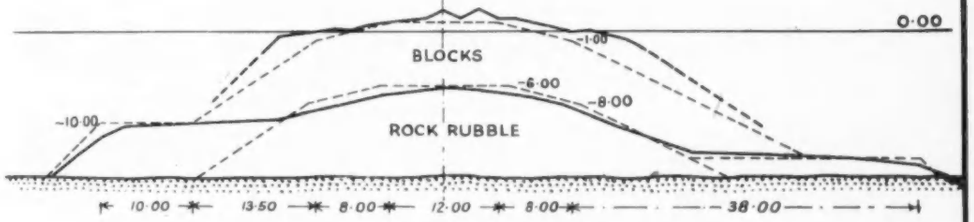
CROSS SECTION OF PIERHEAD.

Scale for Pierhead Section.

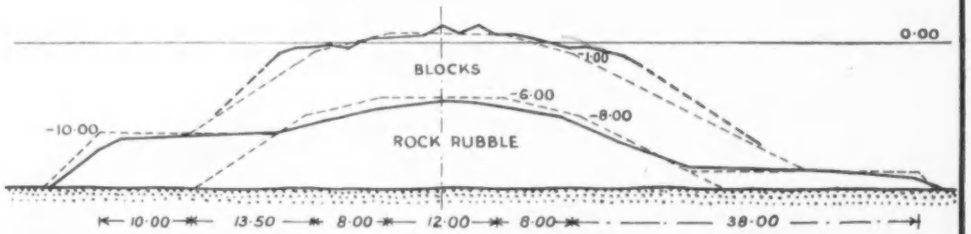
Metres 10 5 0 10 20 30 40 50 Metres



SECTION AS DESIGNED.



SECTION AS EXECUTED.



SECTION AFTER SETTLEMENT.

Scale for Breakwater Sections.

Metres 10 5 0 10 20 30 40 50 Metres

Harbour of Leixoes, Portugal—continued

On the 16th, at 2 p.m.: height of tide 2m. 90; wind S.W., 72 kilometres per hour:—

2h. ∞ 7m. 50

(estimated from a comparison of the readings on the 14th). On the 17th from 11.30 a.m. to 11.45 a.m.: height of tide 0m. 80 to 0m. 90; wind N.W., 40 kilometres per hour; waves N.W.

2h. = 5 metres.

Maximum altitude, determined by binoculars, gauged by the vertical disturbance of a buoy outside the breakwater.

From 11.45 a.m. to 12 noon: height of tide, 0m. 90 to 1 metre; wind, N.W., 40 kilometres per hour; waves, N.W.:—

2h. = 2m. 40.

Maximum altitude, determined by binoculars, gauged by the vertical disturbance of a frame projected over the water at the height of the line joining the heads of the moles, therefore inside the breakwater.

The apparatus for the determination by stationary binoculars, consisted of buoys which indicated outside the outer work its extreme limit and by frames projected over the water. These last gave more exact readings of the vertical disturbance than the buoys, but it was generally difficult to fix the distance from the observer with sufficient approximation.

View of the Harbour Entrance at mid-day of 17th November, 1940.

Finally, in the cyclone of 15th February, 1941, the favourable conditions for the harbour were confirmed, considering that, with a South-west sea there was no tendency towards the usual disastrous effect of waves, due exclusively to violent gusts of wind with velocities of 180 to 200 kilometres per hour in conjunction with an exceptionally high water level; the sole accident worthy of note was the foundering of the Greek steamer *Hadiotis* on rocky reefs which lay near the fishery slipway.

Influence of the Work on Sedimentation at the Harbour Entrance

With the completion of the first elevated portion (400 lin. metres) of the extension, there was induced a sensible sedimentation in the recess formed between it and the part of the North Mole which extended as far as the harbour entrance and it might be permissible to think that the development of the breakwater to its full extent would induce in extent and intensity this accretion, although be it understood there is a clear predominance of direction, North-South, in the littoral travel of alluvium on this part of the coast.

On the other hand, it may be feared that the surmounting of the breakwater by storm waves laden with detritus might cause deposits of sand alongside the harbour entrance.

As to the former conception, this might be justified by the importance of the disturbance of sand in the South-North direction in the alternative evolution of the predominating result above referred to.

It happens, however, that the displacements from the South towards the North, which, under the action of winds and gales from the South-easterly quarter sometimes attain a considerable degree of importance in the extensive beach to the South of the Douro bar, have little influence in the zone between this bar and the harbour of Leixoes, in view of the fact that progress in sand travel along the beach to the South of the bar is interrupted by strong currents at the Douro mouth, from which results its introduction into the river or its projection towards the great external depths, and in any case, the suspension of its progress in mass, less noteworthy during flood tide, but increasing on the ebb. In this way is accounted for the progressive disappearance of beaches which formerly existed between the mouth of the Douro and Leixoes, and which, deprived of their supplies by the general trend of movement from North to South, interrupted by the prominent projection of the Leixoes Moles, remain scarcely subject to the incidence of changes in the adjacent depths and also to a progressive disappearance, since in a situation so exposed the efflux predominates over the influx. Of all these beaches there remains only of any importance, that of Matozinhos, through meeting a certain shelter from the prevailing storms of the North-west quadrant furnished by the conjunction of the Leixoes Moles and through being a zone of settlement, or, so to say, a final refuge for sand from all that zone in its progress from the South to the North under action from the South-east.

Storm Waves at Leixoes Harbour at mid-day of 17th November, 1940.

A simple comparison of the disposition of the beaches and of the bathymetric lines to the North of the North Mole and to the South of the South Mole could convincingly place in evidence the direction of evolution in question: a strong accumulation of sand to the North, disappearance of sand to the South, a fact which would not evince itself if there was a movement of sand from the South to the North of any importance in this zone.

As for the area of settlement, by the surmounting of the breakwater by sand carried by storm waves, it can be understood that the existence of powerful agilation in the water adjoining the harbour entrance must secure the preservation of depth.

Up-to-date experience has confirmed absolutely the favourable anticipations made with respect to accretion.

As a result there has been necessary some maintenance dredging between 1930 and 1937 as shown by the following figures:—

	cub. metres
1930	385,800
1931	181,100
1932	131,600
1933	195,700
1934	190,900
1935	206,500
1936	330,300
1937	102,700

or say an annual average of 215,600 cu. metres; it was only possible to dredge in 1938—the year in which was recommenced practically the construction of the prolongation of the mole or

Harbour of Leixoes, Portugal—continued

outer work towards outside the reef called the Great Leixao, the small quantity of 38,000 cu. metres.

This appreciable relaxation gave rise to a feature which was aggravated in the winter of 1938-1939, viz., the silting in the harbour entrance, which was notified in complaints to the authorities by mariners and pilots.

During the year 1939, in which the outer work continued its development, it was possible to intensify the maintenance dredging, verifying it through the re-establishment of depths in the harbour entrance: it sufficed to remove a volume of 143,000 cu. metres, appreciably less than the average of the eight years from 1930 to 1937.

In 1940, when the outer work had almost attained its full extent and altitude, only 46,800 cu. metres of dredging was required to remove the accumulation at the harbour entrance and notwithstanding two violent storms during the winter of 1940-41, it has not been necessary to provide for any maintenance dredging for 1941, there being during the first half of that year no complaint from users of the harbour.

The Economy Effected, taking into account the cost of Maintenance

A few months short of the completion of the works, it is possible to affirm that the estimate in the contract will not be exceeded, indeed there will be sufficient margin to allow of the acquisition of an important part of the constructional plant.

Moreover, confirmation is given to the anticipations in regard to the cost of maintenance, nil up to the present, in despite of assault from two great storms.

Thus, the economy foreseen in the expenditure on the first instalment in relation to the cost of the second work, to the type of the Casablanca Mole, as designed in consequence of the grave disaster which interrupted the execution of the primary project, and which was estimated at about 100,000 contos, will have, in addition, the capitalisation of the reduction realised annually in cost of maintenance, which, even reducing its amount by 3,500 contos, will represent a capital sum of 70,000 contos, amounting to 170,000 contos of economical advantage following the adoption of the project executed.

Correspondence

To the Editor of "The Dock and Harbour Authority"

PORT OF HONG KONG.

Provision of Wharfage

Dear Sir,—

In continuation of my letter to you dated 4th February: For those of your readers who may be unable to refer to the issues of *The Dock and Harbour Authority* for April and May, 1926, and to the illustrated Supplement which was published with the latter issue, I would acquaint them with the incontrovertible fact that the great bulk of the Colony's trade is water borne (in my opinion it always will be), and that at least 75% of goods imported by large ocean-going and coaster steamers is exported by means of smaller coasters, river steamboats, junks and lighters. Therefore, in any scheme, whether it be designed for the accommodation of deep-draughted, ocean-going steamers, or for vessels of the coaster class, provision *must* be made to accommodate small craft.

Sir David Owen's Proposals

If, as Sir David Owen avers, there has been little done in the nature of planning for future development, I wonder why, assisted by Mr. Duncan Kennedy, he did not avail himself of the opportunity he had of rectifying this omission, by, at least, producing the necessary plans whereby his own "*recommendations for measures by which the Port could in future be developed,*" could be readily and correctly interpreted! The Consulting Engineers clearly illustrated their recommendations by plans; and my report was illustrated by two diagrams, one map and ten drawings, the general plans being drawn to a scale of 1,000-ft. to 1-in. and the detailed plans, sections, and elevations to scales of 70-ft. and 50-ft. to 1-in.

Hong Kong Central

He refers to a plan prepared by one of my former assistants, Mr. Andrew Nicol, Assoc.M.Inst.C.E., showing a scheme for the widening of Connaught Road and the construction of 13 new piers in lieu of the existing piers. He does not tell us much about the scheme and leaves it for the Port Trustees to work out for themselves. But, from the plan published in *The Dock and Harbour Authority* for January and his short description, it appears to bear a remarkable resemblance to the scheme of development designed by me in 1924 to accommodate the local passenger and cargo trade, ferry services, etc., and to satisfy the requirements for its better control; the only difference being that it is now proposed to extend the scheme along a frontage some 800-ft. longer, presumably to provide accommodation for coaster steamers. I note that on the plan the scheme is described as:—"Central Scheme of Piers and Transit Sheds for *Coastal* and River Steamers."

To attempt to handle the coaster-steamer trade in this locality in addition to the river-steamer trade, ferry services, etc., will be a great mistake. Surely the mode of transport has not been considered! How, I wonder, is accommodation to be provided for the more efficient handling of the export trade which, in normal peace time, is largely carried by junks and lighters? We must not perpetuate the existing conditions created by hundreds of junks, lighters and sampans all striving for the most advantageous positions where they may tie-up, bow-on to the sea wall, for the purpose of loading and discharging cargo. The recommendation, to my mind, is nothing more or less than tinkering with the problem. In effect it means: attempting to handle over 50% of the whole trade of the Port on a frontage less than ¾ mile in length and only 150-ft. in width. It simply cannot be done.

In 1922 The Town Planning Committee and Mr. (now Sir, and a retired Colonial Governor) Arthur Murcheson Fletcher, Acting Colonial Secretary, speaking on behalf of the Government, opposed the placing of any large piers along the front of the City of Victoria for the accommodation of steamers of the coaster or ocean-going classes; and I have no hesitation in saying that I think they were quite right.

In my opinion Hong Kong Central should be developed solely for river steamers, ferry services, public use and official purposes and the coaster steamer trade should be centered at North Point. The Hong Kong Central and North Point Schemes which I designed and recommended in 1924 are fully described in the issue of *The Dock and Harbour Authority* for May, 1926.

Kowloon

If I interpret the late Sir David Owen's plan correctly, then he envisaged the necessity arising for 7 additional berths for ocean-going steamers. For the more efficient handling of the trade as existing in 1924 (the peak year of the Port's tonnage), I concluded that 8 additional berths might be required.

One of the 7 berths he suggests should be provided to the N.N.E. of Messrs. Alfred Holt and Co.'s wharves; presumably for the expansion of the trade carried on by the "Blue Funnel" steamship line. As a matter of fact the berth is one of two berths in this position included in the alternative scheme for the development of Hung Hom Bay which I recommended in 1924.

The other 6 berths *the plan suggests* should be provided by 3 piers (say 650-ft. in length, 50-ft. in width and spaced about 350-ft. apart) to the North of The Hong Kong and Kowloon Wharf and Godown Co.'s existing piers, thus perpetuating the existing method of handling the trade, which it is agreed, is not the most efficient. The plan, however, we are told, shows the piers *in tentative form* and it is recommended that, in designing them *consideration should be given to the question of providing, on the piers themselves, transit sheds, passenger accommodation and railway sidings.*

In giving effect to this recommendation the piers would require to be at least 650-ft. in length, 250-ft. in width and, if it is intended to provide 6 berths for ocean-going steamers, they should be spaced to form ship basins about 400-ft. in width. The length of frontage taken up by 3 such piers will extend some 250 yards farther to the North than that indicated on the plan, and in this position the existing depth of water varies from 22½-ft. to 24-ft. at L.W.O.S.T. To provide and maintain the necessary depth of water in an approach channel and alongside any quay walls in this position will involve the Port Trustees, or the lessees, in considerable capital and recurrent expense in dredging. Moreover, I feel confident in advising with some degree of assertion—based upon many consecutive years' *daily* observation of the effects produced by the construction of important new works in certain tidal waters in this country and my knowledge of tidal currents in the harbour of Hong Kong—that any piers in this position, more particularly so if of solid construction, projecting in an easterly direction, will induce accretion in the vicinity of the existing piers; and so the Hong Kong and Kowloon Wharf and Godown Co. will have to meet increased recurrent expense in dredging to maintain the necessary depths of water.

But, how is the trade to be handled at three such piers? If the quay walls on each side of the proposed piers or jetties carrying transit sheds, etc., are to be designed to accommodate deep-draughted ocean-going steamers (whoever made the plan certainly had in mind 6 berths) then the scheme is quite impracticable! Either the ocean-going steamer would have to give way to the junks or vice versa; and the junks will assuredly "win" when there is no more room in the sheds for the steamer's cargo: Not a very attractive proposition! Perhaps this is one of the recommendations which (quoting your Editorial in the December issue) struck a "prominent shipowner" with terror and caused "a leading shipping journal" to say that "the report contains numerous suggestions, which, if adopted, may well ruin what has hitherto been one of the best ports in Eastern waters."

Taking the long view and having regard to the Colony's future general welfare, the most satisfactory arrangement of quay accommodation, to secure the most rapid despatch and the greatest economy in the handling of goods imported by ocean-going steamers, is unquestionably the system of alternating ship and

Correspondence—continued

junk basins recommended in 1922 by the consulting engineers—Messrs. Coode, Fitzmaurice, Wilson and Mitchell.

As to the location where such accommodation should be provided: Contrary to the opinion expressed by the late Sir David Owen regarding the West side of Kowloon Peninsula; Hung Hom Bay, due to its sheltered position and depth of water in the approaches, offers the best site in the harbour front for the provision of wharfage with which, if required, railway communication can be readily given. Moreover, in this location, a practicable scheme of works can be so designed, which, when completed, will afford, not only to all small craft operating in the trades which may be carried on in this vicinity, but also to at least 6 large ocean-going steamers moored alongside quay walls, complete protection from typhoon gales blowing from any direction. And in the carrying out of the scheme in sections; shipping operations at any of the existing wharves, or, at any of the new wharves which may be completed, will not be incommoded in any way. These arguments cannot be adduced in favour of the West side of the Peninsula.

In holding this opinion I was supported in 1920 by the then Director of Public Works, the late Mr. Wm. Chatham, C.M.G., M.Inst.C.E., who held that position for over 20 years; by the late Sir Maurice Fitzmaurice, C.M.G., P.P.Inst.C.E., etc., and by many others. In fact, this was the consensus of opinion held by those shipping interests of the Port who viewed the question of development quite impartially.

My conclusions can be best expressed by quoting the Consulting Engineer's remarks regarding Hung Hom Bay versus North Point. The analogy is not quite the same as they were not at the time fully informed of the trade, its " flow " and mode of transport, or of the purpose for which it was proposed to develop North Point foreshore. If I remember aright, I had not even then been instructed to prepare a complete scheme for the Development of the Port: But this is what they said:—

" It would be very inadvisable to divide forces and funds
" in attempting to construct a limited length of deep water
" quay in this position rather than concentrate upon Hung
" Hom Bay where the possibilities of development and ex-
" tension are infinitely superior."

HUNG HOM BAY.

Scheme Recommended by the Consulting Engineers in 1922.

As stated in my letter dated 12th January, the Consulting Engineers' recommendation regarding the provision of wharfage for ocean-going steamers was the construction in the bight of Hung Hom Bay of a reclamation of 48½ acres from which were to project in a South-South-Easterly direction, 6 jetties, each 1,200-ft. in length and 260-ft. in width; each carrying two " transit-warehouses " 500-ft. in length and 160-ft. in width, thus leaving roadways 50-ft. wide on each side between the sheds and the quay face. The jetties were spaced to form, alternately, ship and junk basins 400-ft. wide and 140-ft. wide respectively. The scheme when completed would provide lengths of berthage of 8,600-ft. for steamers and 5,650-ft. for junks, the depths of water at L.W.O.S.T. recommended to be provided for steamers being 37-ft., and for junks 16-ft. The scheme provides for 14 steamers berthing simultaneously.

They recommended the carrying out of the scheme in two sections, the first embracing Jetties No. 1 and 2 on the West side of the bay, the construction of which, together with 7 acres of reclamation and a certain amount of dredging, they estimated would cost £1,260,000.

Were it not for the great loss of trade caused year by year by typhoons, more particularly by the fear of them, I would have no hesitation in saying that the scheme recommended is the perfect one: No better scheme, in my opinion, could be designed to afford easier manœuverability for large ocean-going steamers and, excepting for the period, May to October (the typhoon season), to secure quicker despatch or greater economy in the handling of goods. I consider the depths of water recommended to be somewhat extravagant, but this is a matter, which, when the time comes, will no doubt be given most serious consideration by the Trustees.

Alternative Scheme Recommended in 1924

Having in view the shelter of craft I designed an alternative scheme for the development of Hung Hom Bay; and although estimates of cost were given, no recommendation was made for immediate construction for the reasons set forth in the general considerations by which recommendations were limited. These are briefly stated in my letter dated 12th January.

The scheme when completed would provide lengths of berthage of 8,800-ft. for steamers and 4,240-ft. for junks, the depths of water at L.W.O.S.T. recommended for steamers, varying from 30-ft. to 36-ft. and for junks, 12-ft.; accommodation for 15 steamers berthing simultaneously; and afford, to all small craft and 6 large ocean-going steamers, complete protection from typhoon gales blowing from *any* direction. The scheme was briefly described and illustrated in the issue of *The Dock and Harbour Authority* for May, 1926.

If it should be decided to concentrate on the development of Hung Hom Bay: Then provided:—

(a) A maximum length of frontage immediately to the N.E. of Messrs. Alfred Holt and Co.'s premises is reserved for extension of their wharfage; (after all this had been their sphere of activity for many years); and
(b) Some control such as that recommended both by the late Sir David Owen and myself is instituted;

I see no reason why The Hong Kong and Kowloon Wharf and Godown Co., which was formed so long ago as 1886, and can rightly claim to have played no small part in the development of the Port, should not be granted leases of as much wharfage in Hung Hom Bay as they may be prepared to operate.

In conclusion: I wish to thank you for affording me the opportunity of calling attention to my own study of this problem and to the service which I may have rendered by my investigation and report. In these days of trial and tribulation it has indeed been a pleasure to live in the memory of many happy years spent in that beautiful Colony. Sir David Owen said that the people of Hong Kong are *groping in the dark for some solution of the Port problem*. I hope that some day my review of the subject, expressed in this and in my two previous letters, will reach the Trustees and that what I have written may help " lighten their darkness "; and that, in the not far distant future we shall have the pleasure of reading in your excellent periodical their final conclusions, and see portrayed the " Eclectic Scheme of Port Development " which has been adopted by the Government.

3, Grange Park,
Westbury-on-Trym,
Bristol.

Yours faithfully,
JOHN DUNCAN.
12th March, 1942.

Notable Port Personalities

XXI—Mr. Tiley S. McChesney

Mr. Tiley Scovell McChesney, Secretary-Treasurer of The American Association of Port Authorities, Advisory Attaché of the Board of Commissioners of the Port of New Orleans, and former Chief Administrative official of the Board, was born in New Orleans, Louisiana, on the Mississippi River.

Mr. TILEY SCOVELL McCHESNEY.

Commencing his career in port work in 1887, at the age of sixteen, in a very humble capacity with the lessees of the public docks, he enjoys to-day the reputation of having served in port work longer than any other individual in North America—a period of over fifty-four years.

In 1901 Mr. McChesney became attached to the staff of the Board of Commissioners of the Port of New Orleans, a State agency created to administer the Port.

In 1907, he was appointed Treasurer and Assistant Secretary of the new Board, later being assigned to the additional post of Assistant General Manager, in which capacities he served until 1931, when his services were continued in an advisory capacity.

Mr. McChesney has also been a member of the American Association of Port Authorities for the past thirty years, and has served for the past twenty years as Secretary-Treasurer of that organization, which consists of sixty-one ports in North America, with affiliations throughout the world.

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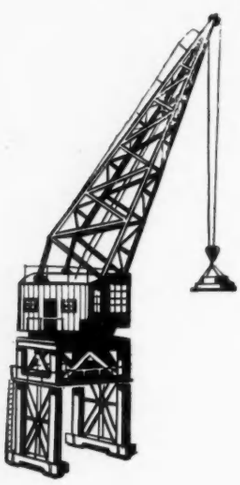

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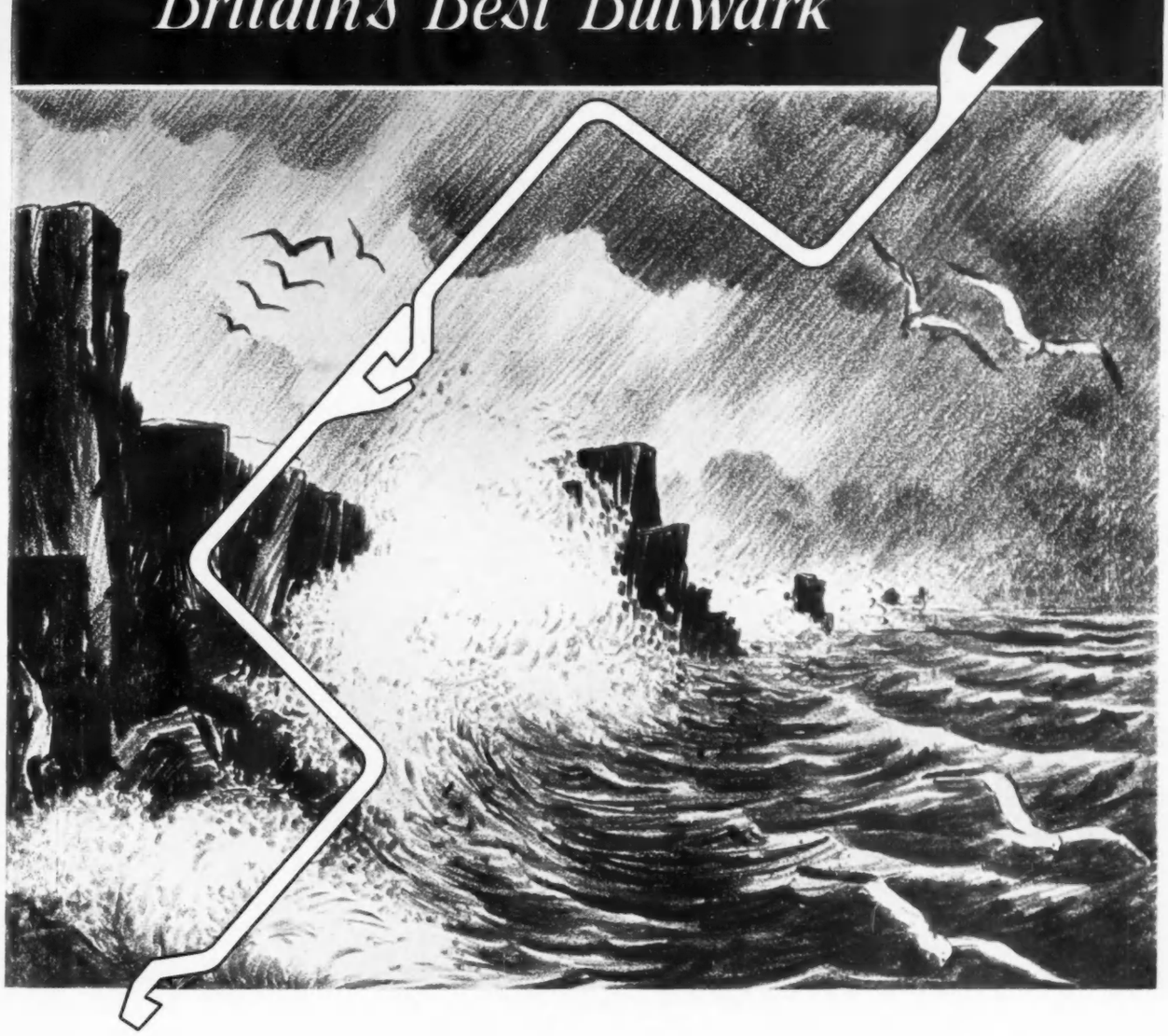

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Notes of the Month

Port Directorship Appointment.

Mr. D. Bulay-Watson has been appointed by the Minister of War Transport, Regional Port Director for the Humber Area.

Seaborne Traffic at Swedish Ports.

The volume of seaborne traffic during 1941 at Swedish ports decreased by 53 per cent. in comparison with the returns for 1939. The reduction on the 1940 figures was 6.3 per cent.

Increase in Light Dues.

A recently issued Merchant Shipping (Light Dues) Order, brings into effect as from March 6th, 1942, the increase in light dues to 200 per cent. above the level of the scale hitherto is in force.

London Dock Labour Scheme.

The Dock Labour Scheme for the Port of London under the Essential Work (Dock Labour) Order has been approved by the Minister of Labour and National Service. It came into force on March 16th.

Rangoon Port Staff.

The safe arrival at Calcutta of the entire staff of the Rangoon Port Commissioners has been announced. They were the last to leave the port and had been instrumental in carrying out the demolition work.

Floating Dock Test at Newcastle, N.S.W.

The junction of two hitherto independent sections of a floating dock at Newcastle, New South Wales, having been effected, a sinking test has been satisfactorily carried out. The dock has now a lifting capacity of 15,000 tons, and will accommodate vessels with an overall length of 630-ft. The maximum draught for shipping entering the dock is in the vicinity of 20-ft., though this figure is not yet officially stated.

Mersey Dock Board Changes.

By the death of Mr. Harry Sutton Timmis, the Mersey Docks and Harbour Board has lost one of its oldest members. Mr. Timmis, who was in his 80th year, had been a member of the Board for nearly 40 years and had served on most of the committees. At the time of his death, he was the oldest serving member. The vacancy has been filled by the appointment of Colonel Felix Behrend, of Messrs. Bahr, Behrend and Co., steam shipping agents of Liverpool.

Blyth Harbour Concession

At a recent meeting of the Blyth Harbour Commission, Colonel N. J. Wright was re-elected Chairman for the ensuing year and Mr. A. S. Witherington, vice-chairman. Blyth is one of the few East Coast ports of importance which have not yet had to approach the Ministry of War Transport for permission to increase their dues and charges; these remain at pre-war level, in spite of a declining revenue and the rising cost of labour. Col. Wright commented at the meeting on the sound financial position of the Commission.

New Wharf at Napier, N.Z.

The second of two new reinforced concrete wharves at the Port of Napier, New Zealand, constructed as part of a deep water port development scheme, is at the point of completion. The wharf, which is 761-ft. in length, will accommodate the largest cargo vessels regularly trading to the Dominion. The depth alongside is 35-ft. at low water. The dredging of the approach channel is now in hand. The wharf will be equipped with 5 lines of railway sidings for export traffic and an installation of 5-ton electric portal cranes, should these be found necessary.

Port Trust Howler.

In an Efficiency Bar Examination a candidate when asked to describe the " Digest of Rules, etc.", referred to them as follows: " There are people who eat their food that in the long run they suffer from stomach trouble. The food taken and it must be chewed so as the saliva to mix with food to facilitate easy digestion. Generally any sort of aching springs out of bad stomach the cause being indigestion. *The Port of Bombay Journal*, Oct.-Dec., 1941.

Tyne Improvement Commission.

Mr. W. A. Souter, Chairman of the Finance Committee of the Tyne Improvement Commission, when presenting the accounts to the Commissioners at a recent meeting of the Board, under the Chairmanship of Sir Arthur M. Sutherland, Bt., reported that, after meeting all expenditure and making full provision for interest charges and loan redemption (£116,000) in accordance with their statutory requirements, the accounts have balanced to within £20—a very satisfactory result having regard to all the circumstances.

Glasgow Dock Cartage Control

As from March 1st, the functions of the Glasgow Dock Cartage Control, a public company set up at the beginning of the war to regulate and expedite the work of the harbour, have been taken over by the Ministry of War Transport road haulage branch.

Condition of Rotterdam Quays

According to a recent statement of Mr. N. T. Koomans, manager of the Port of Rotterdam, as reported in *The Motor Ship*, although the city has been badly damaged, the harbour front and its equipment as a whole are in good condition.

Proposed New Quays at Buffalo Harbour.

The Minister of Railways and Harbours in the Union of South Africa has visited Buffalo Harbour with a view to the establishment of two or three new temporary quays to meet war requirements in regard to ship repairs. The new quays, which are being proceeded with without delay will provide accommodation for at least six vessels undergoing repairs.

Developments at Port of Brooklyn

The Department of Docks of New York City, U.S.A. has in hand the construction and reconstruction of piers and ferry terminals at Brooklyn, including piers at 30th, 31st and 33rd streets, South Brooklyn, 3 piers at foot of Broadway, East River, and the Ferry Terminal at 39th street, North River.

Developments at the Port of Vigo

Extensive works are being executed at the Port of Vigo, on the north-western Spanish coast, at an estimated cost of 18 million pesetas. The fishery harbour is being enlarged and a new dock added. Further developments are in contemplation, the cost of which will run to 28 million pesetas.

German Harbour Development.

The harbour of the town of Pozen (Poznau) on the River Warthe, formerly in Polish territory but now occupied by the Germans, is to be enlarged, according to a Nazi broadcast, and to be connected with the German inland waterway system, provision being made for the passage of ships up to 1,000 tons between Poznau and the River Oder.

Graving Dock Company's Finances.

The annual report of the Mercantile Dry Dock Co., Ltd., South Shields, for the year ended December 31 states that the profit and loss account, including the sum of £6,362 brought forward, shows a credit balance of £17,571, after making provision for income tax and excess profits tax. For 1940 the credit balance was £21,142, including £3,799 brought forward.

Death of Maker of Ship Coaling Records.

The recent death of Mr. G. R. Jones at Westbury-on-Trym recalls the part he played in 1912 in creating a world's record by getting 4,000 tons of coal into S.S. *Olympic* in 14½ hours at Southampton. Later at Avonmouth, Mr. Jones was responsible for supervising the coaling of S.S. *Manxman* with 445 tons in 8¼ working hours, S.S. *Everton Grange* with 1,343 tons in 35 hours and S.S. *Port Royal* with 1,730 tons also in 35 hours.

New Pier at New Jersey City, U.S.A.

Following the destructive conflagration at the stockyards of Jersey City, U.S.A. on May 31st, 1941, a new pier is being constructed by the Pennsylvania Railroad Company. The structure will be of concrete and steel, 1,314-ft. long and 139-ft. wide. It will replace an old timber pier in the north-east section of Hersinus Cove Yard at Sixth Street and North River, Jersey City. The work will occupy about eight months.

Seaham Harbour Dock Company

At the recent annual meeting of Seaham Harbour Dock Company, Mr. Malcolm Dillon, managing director, who presided, said that no report or balance sheet had been issued, but the results of the past year were not unsatisfactory. The retiring directors, Viscount Castlereagh, M.P., and Mr. J. H. B. Forster were re-elected and the retiring auditor, Lord Plender was reappointed.

Inland Navigation in Germany.

According to official reports, transport on German rivers and canals increased by more than 20 per cent. in 1941, but did not quite equal the volume of traffic recorded before the war. The increase was mainly due to full resumption of shipping on the Upper Rhine, but shipments on the Danube were also larger and led in January to the opening of a new shipping office at Vienna. River and canal shipments of ore increased in 1941 by 77 per cent., wood by 37 per cent., building materials by 36 per cent., and coal by 20 per cent.

Ropeways at Docks and Harbours

Valuable Waterside Adjuncts

By HARRISON ROE, M.I.Mech.E.

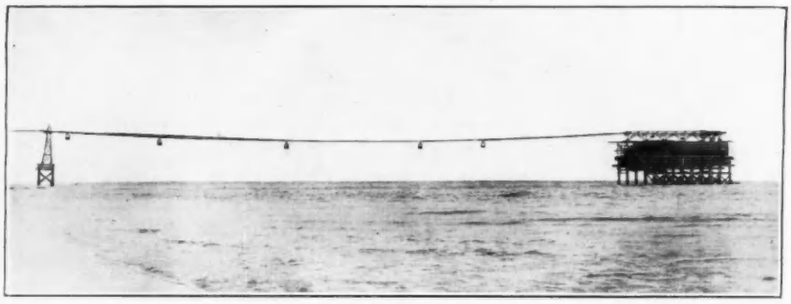


Fig. 1.

AERIAL Ropeways have for many years been used for loading ships lying off-shore, but it is only comparatively recently that their utility immediately adjacent to docks and harbours has become recognised. Modern improvements, resulting in greater flexibility and general performance, makes them an efficient and economical means of meeting a variety of purposes in a practical manner and they are now found in almost all spheres where materials in bulk have to be handled at dockside.

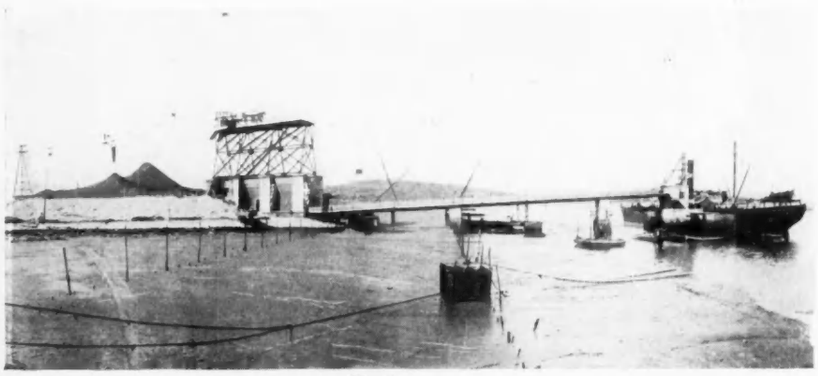


Fig. 2.

Outlying Installations

In earlier examples the ropeway was carried out to deep water, to a pier on which the unloading station was built, the intermediate trestles being constructed on piles or the like. (See Fig. 1.)

Fig. 4.

Later, to avoid the high cost of building substantial pier work and hoppers often at some distance from the shore, it has become more usual to arrange for the stock to be formed at a convenient position on shore, forming this stock by means of a ropeway operating continuously at a moderate rate. From this stock, conveyors carried on light gantry work take the material at a rate which might be 10 or 20 times that of the ropeway capacity, and load it into ships through telescopic swinging shoots. Fig. 2 shows a typical example of such a plant handling iron ore on the north coast of Spain. The ropeway has an hourly capacity of 60 tons and discharges automatically into a 5,000 ton hopper, constructed for the most part below ground level in the form of a "V." Running longitudinally under the hopper is a belt conveyor loaded through a series of shoots and gates, the outer end of which is carried on light pier work to a hinged and swivelling loading boom fitted with a telescopic shoot. The conveyor has a capacity of 500 tons per hour and thus enables a 5,000-ton boat to be loaded and turned in a couple of tides.

Fig. 3.

Many similar installations are to be seen along the north coast of Africa, and off the coast of Spain, loading iron ore, phosphates and other minerals; the capacity of the ropeways varies from 50 to 150 tons per hour, whilst the belts may load anything up to 1,000 tons per hour. The Mediterranean being practically tideless, telescopic loading shoots are seldom found necessary; instead, a heavy sloping baffle plate is frequently lowered into the holds of the ships, against which the falling mineral impinges, thus breaking the impact and to large extent trimming the load automatically. The majority of these combined ropeway-conveyor plants are operating in the open sea and the ships tie up fore and aft to mooring buoys. For the reason that advantage has to be taken of relatively calm weather for loading, it is common practice to build the hoppers or storage sufficiently large to permit two vessels being loaded immediately following one another.

Obviously, with plants having only one fixed discharge point, one hold only can be loaded at a time, and the ship has to be warped when it becomes necessary to load a second hold for trimming or other purposes. A development of the forgoing is where the main belt discharges on to a shorter cross belt mounted on a travelling carriage fitted with the necessary throw-off mechanism, the cross belt being capable of longitudinal movement. The entire loading length of the vessel can thus be covered without the necessity of moving the ship.

The Tilmanstone Ropeway

An outstanding example of this type of plant in this country is that constructed for the Tilmanstone Colliery—outstanding because it is the only plant of this nature in the British Isles, and the scheme met with much opposition before it was finally adopted.

The ropeway—a monocable, 7¼ miles in length and built to carry 120 tons of coal per hour—runs from the Tilmanstone Colliery to the extremity of the eastern breakwater at Dover, three-quarters-of-a

Ropeways at Docks and Harbours—continued

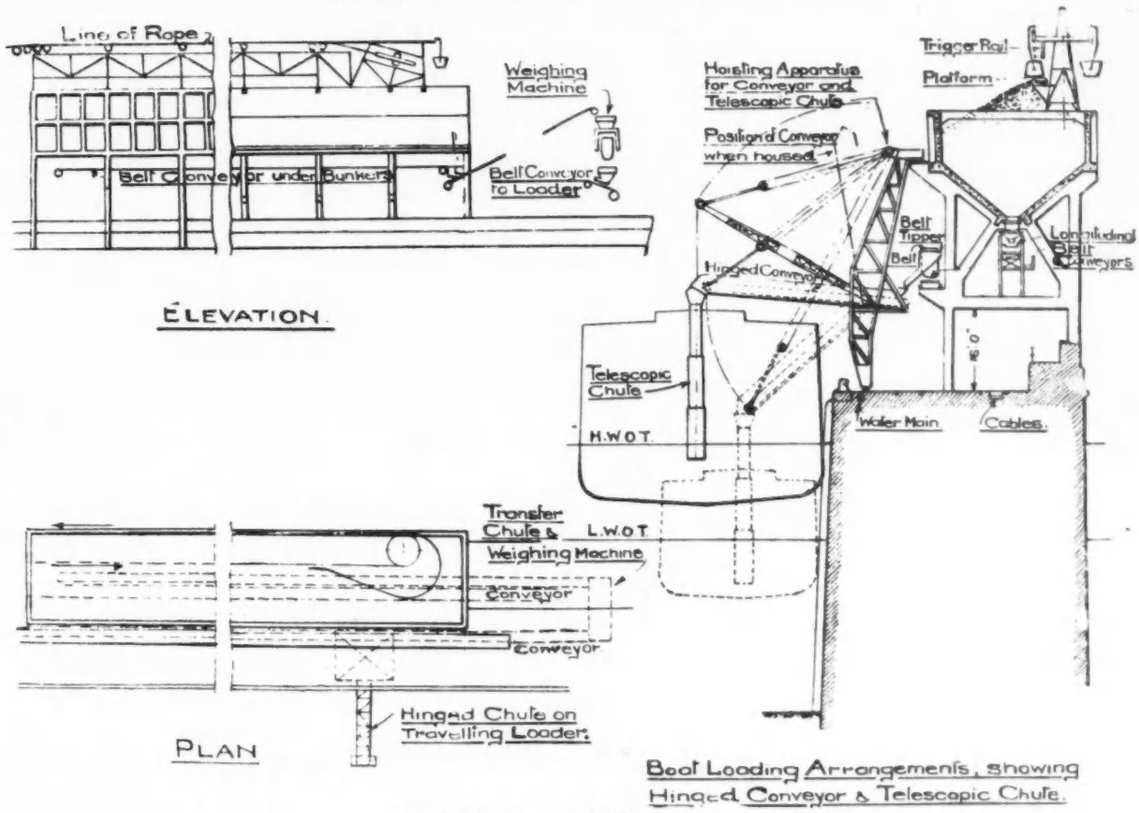


Fig. 5. Tilmanstone Colliery Ropeway.

mile from shore. On the breakwater is constructed a 5,000-ton reinforced concrete bunker—having a series of bottom discharge gates—into which the ropeway buckets are automatically emptied at any desired point. Under the bunker run two parallel belt conveyors, each having a capacity of 500 tons per hour. One belt travelling outwards and running immediately below the centre of the bunkers, is loaded through the gates by a travelling mechanical opener. At its extremity coal is transferred through an automatic weighing machine to the second belt, which runs in the opposite direction outside the bunkers on the harbour side. From this second belt coal is loaded into ships by means of a travelling gantry fitted with a throw-off mechanism and an outrigged loading belt connected to a telescopic tubular shoot. The shoot is filled before the bottom door is opened, thus minimising breakage and dust. Figs. 3 and 4 show a ship being loaded, whilst the general arrangements are clearly indicated in the sectional diagram Fig. 5.

On account of its length and capacity the ropeway is constructed in two sections, the second of which contains two angle stations, one in a tunnel built in the cliffs, through which the ropeway runs to emerge on the sea side.

At the loading end of the ropeway the buckets are fed from a large hopper, round which the buckets travel automatically on a graded rail, being stopped where required for loading. The ropeway seldom operates for more than three days per week; nevertheless, the all-in operating costs of carrying and loading, even on this limited basis, are worth recording. Carrying 11,500 tons during one month in 1939, the all-in costs of filling the loading bunker, loading and conveying the coal 7¼ miles to Dover, discharging into hopper and loading ships, amounted to 8.83 pence per ton. This figure includes all labour and supervision, power, stores and renewals, rents and wayleaves, insurance and rates, and general charges. Separate costs for the ropeway and loading belts are not available, but for the latter the costs would probably be about ½d. per ton loaded.

A Cyprus Installation

An interesting and up-to-date example of a ship loading plant, where vessels are loaded directly by a ropeway from a stock formed on shore, is afforded by a comprehensive installation comprising machinery for forming a large stock pile and filling the ropeway buckets, and a heavy capacity bi-cable ropeway. The plant is installed on the coast of Cyprus and handles pyrites at rates of 100 to 200 tons per hour.

Storage space is obtained by a cutting about 150 feet in length in the low cliffs forming the foreshore, and running parallel to

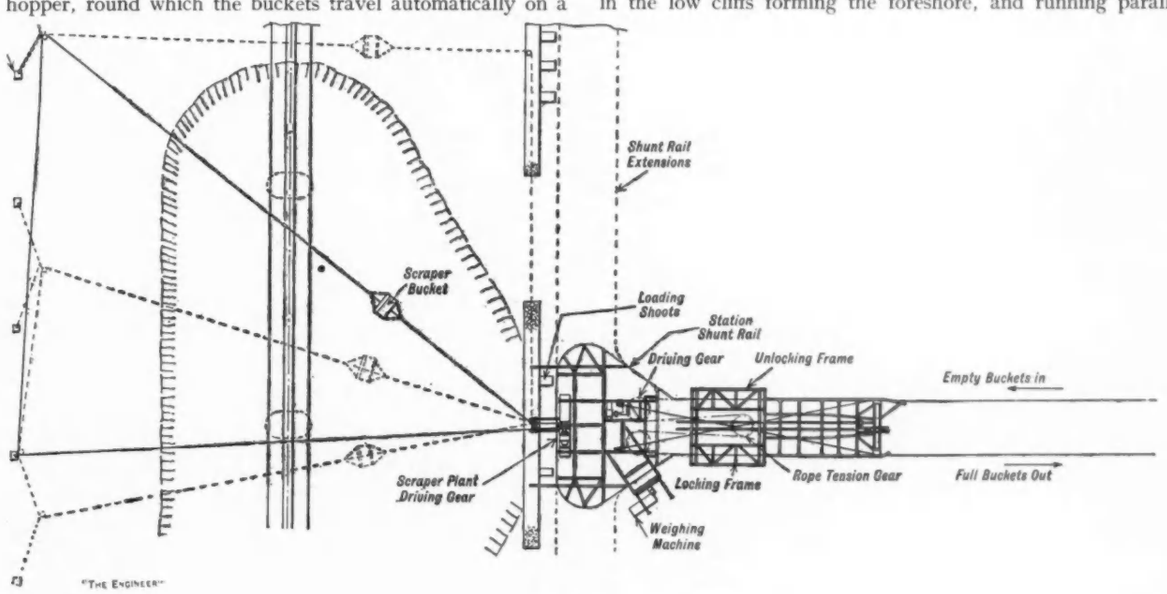


Fig. 6.

Ropeways at Docks and Harbours—continued

the coast line; this storage being filled by a conveyor carried over its entire length and fitted with travelling throw-off gear. Operating over this storage is a scraper bucket, the tail rope of which can be anchored to either of the series of posts spaced along the back of the storage, thus permitting ore to be scraped from any part of the store to a convenient point for loading the buckets, which is effected through the usual loading shoots and gates.

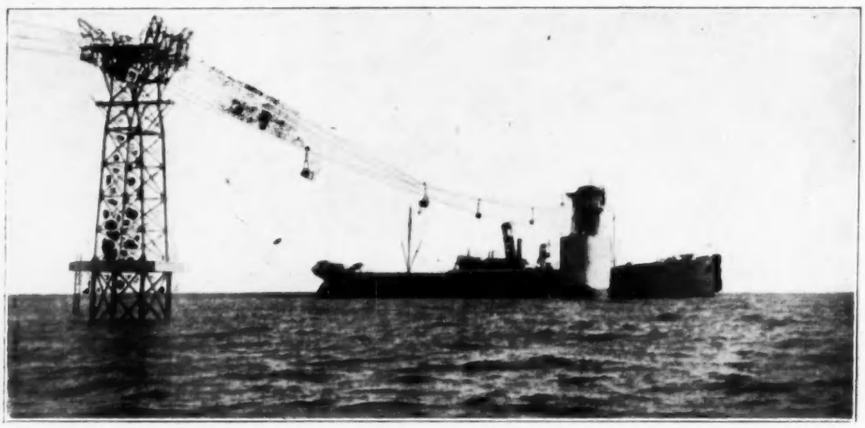


Fig. 7.

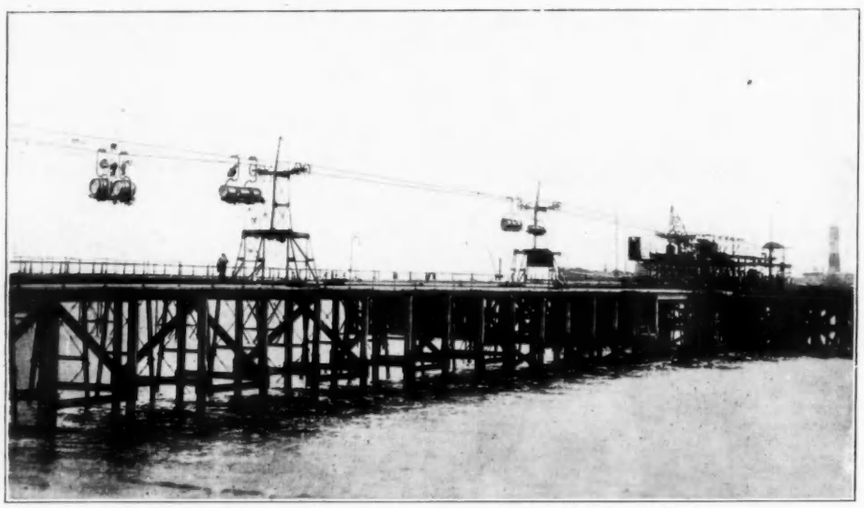


Fig. 8.

Fig. 9.

The ropeway is carried out a distance of 1,800-ft. to deep water, where a cylindrical concrete pier, or dolphin, is constructed, and on which is the return and discharge station of the ropeway. This station is of orthodox type, the buckets automatically emptying their contents at the rear end into a small receiving hopper. To this hopper is attached a long hinged shoot, capable of a slewing movement of about 60 degs. either side of the centre, and fitted with an extending jib shoot so as to accommodate the loading position to varying heights and positions of the ships' holds.

Four intermediate trestles are required for supporting the ropes and loads, and three of these are also constructed on concrete piers built in the sea. Fig. 6 shows in diagram the arrangements of the various units at the loading end on shore, while Fig. 7 shows the unloading end of the plant.

Dual Purpose Ropeways

Aerial ropeways are also used for the dual purpose of loading and unloading between ships and shore for stock. Two such installations are operating in Great Britain between oil refineries and ships, carrying oil barrels from the ships and returning bitumen and other oil products from the refinery. Fig. 8 is a view of one of these ropeways showing a portion of the line and loading and unloading pier. Oil barrels are unloaded from the ships' holds at the rate of between 80 and 90 tons per hour by cranes on to a platform, from which the ropeway carriers are loaded. In the works the barrels are unloaded from the ropeway at a ground level station 580 yards from the pier head, from which point the empty carriers travel a further 750 yards to a second point, where drums of bitumen and other oil products are loaded on to the ropeway for conveyance to the shipping wharf.

At both the intermediate and main loading and return station an auxiliary slow-moving chain is introduced to propel the carriers along the shunt rails. Barrels and drums are handled off and on to the carriers whilst in motion, by means of short ramps fitted with stops, which are operated by the loading hand, two oil barrels being carried in one direction and three oil drums per carrier in the other. The combination of loading ramps and slow-moving carrier propelling chains enables the stations to be operated with a minimum amount of labour and confusion.

Paper Works Installation

Aerial ropeways are also used in Great Britain for conveying materials from docks and wharves to works and factories and stores. A good example is that of a plant operating between the Thames side and to storage yards at the paper works of Messrs. Edward Lloyd, Ltd. (Fig. 9). This ropeway handles all the incoming logs and pulp wood arriving by ship at the rate of 114 tons per hour, the length of the ropeway being 1½ miles. Timber is unloaded automatically from a height of about 110 feet along either of three branch lines. The switching of the carriers from the main to the branch lines is automatic and electrically operated. Thus very considerable stock piles are formed with the minimum of labour and operating costs.

Two-directional Conveyance

For the purpose of conveying ores, goods, etc., in both directions between ships and works or stores, ropeways are frequently installed. Illustrating the flexibility of aerial ropeways, Fig. 10 shows in outline a ropeway and ancillary plant handling coal, zinc

Ropeways at Docks and Harbours—continued

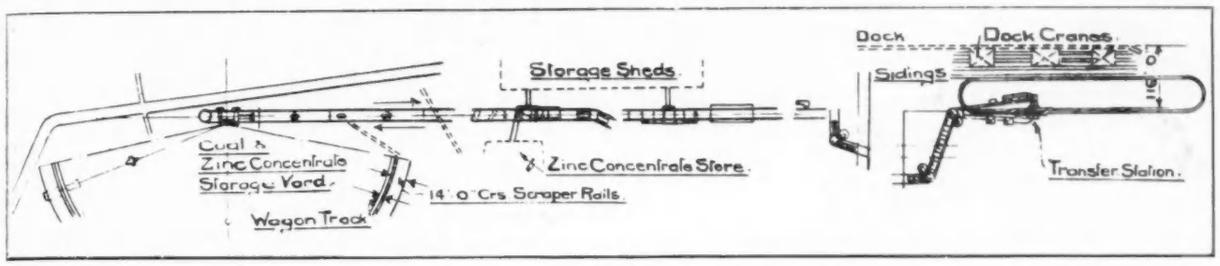


Fig. 10.

concentrates and phosphates in one direction and superphosphates in the reverse. To permit these various products to be handled without confusion, the buckets are detached from the carriers at the loading station and travel by bogies, on which they are carried around on a ground track built parallel to the wharf by a haulage rope. The track runs under a series of travelling hoppers which are filled with coal, phosphates, etc., by the dock cranes. The full buckets then travel back to the ropeway loading terminal and again transfer to the ropeway for conveyance to the works. The contents of the buckets are discharged at will at either of the two intermediate unloading points in the works, or at the terminal of the ropeway where stocks of coal and other materials are formed by a dragline scraper. These are later reclaimed from stock by the same scraper and loaded into wagons for distribution in the works (Fig. 11). Both zinc concentrates and phosphates are taken from the ropeway to stores by means of conveyors. Superphosphates are taken from the works on the return side of the ropeway and loaded into ships' holds

Fig. 11.

by cranes, which lift the buckets off the bogies on the ground track. The buckets are all of the bottom discharge type, which, apart from being automatically emptied, ensures that materials of varying consistency will be properly discharged. The ropeway has an overall length of 1,700 yards, and the materials are carried at rates varying between 100 to 250 tons per hour on the incoming side—dependent on the specific gravity of the material carried—and 95 tons per hour outwards of superphosphates. The plant includes no less than five loading and discharge stations, and, furthermore, passes through four angle stations on its route and crosses various roads and sidings.

Similar ropeways are also in operation in this country carrying gypsum, limestone, etc., from dock and returning cement, coal and other materials for shipment overseas.

To reduce labour charges on these plants many automatic appliances are used, as, for example, automatic tipping buckets, transfer gears for transferring the bucket bodies from their carriers to bogies and *vice versa*, electrically operated switches and turntables, and at stations an auxiliary slow moving cable or chain propelling the carriers along the shunt rails.

All the ropeways mentioned in the foregoing are of British design and manufacture, and though it might be true to say that the development of this means of transport for purposes other than straightforward haulage, first started on the Continent, modern improvements and advances in the design and construction of British plants puts them now in a category unsurpassed by any other country.

Advantages of Ropeways

No attempt has been made in the present article to describe in detail individual installations—many of which have already been the subject of articles in the technical press—but rather to indicate some of the many and varied uses to which aerial ropeways can and are being put for transport to and from docks or shipside.

There are, moreover, further aspects resulting from their use which have important bearing on considerations other than transportation, but which seldom seem to be appreciated. For example, it is not always realised that a railway truck is used as a carrying medium for only comparatively short periods; probably for three-quarters of its life it stands on a siding, either empty or full, as a storage medium. It is difficult to arrive at to-day's costs, but some few years back a 10-ton truck would have cost about £160, which means that users were then paying about three-quarters of that amount, or, say, at the rate of £12 per ton for storing, as compared with the cost then of £4 per ton for storing in a reinforced concrete bunker, assuming coal to be the material involved. Ores would cost less on account of their greater density. Furthermore, a 10-ton coal truck occupies nett space of about 150 square feet, sufficient to store 55 tons in a bunker of only 15 feet in height.

In other words, and taking the Tilmanstone scheme as an illustration, 5,000 tons of coal are there stored in a bunker covering an area of 250 feet by 30 feet, which cost in 1928 £20,000, or £4 per ton for storage. Had railway wagons been used in a manner enabling a ship to be quickly loaded, 500 wagons, costing £80,000, would have been required, used as storage equivalent to £60,000, or £12 per ton, whilst allowing for three lines of sidings the ground space occupied would be 3,190 feet by 30 feet. On the foregoing and assuming hoppers to be used, the saving in interest at 5 per cent. on the lesser capital required would amount to about £2,000 per annum, to which must also be added saving in ground rents, repairs to wagons and demurrage on wagon hire, etc. A further relevant point is that this type of plant can be built and operated without hindrance to existing sidings or traffic passing thereon, seeing that both bunkers and conveyors can be built well above railway loading gauges (Fig. 12).

There are admittedly factors which militate against the use of aerial ropeways in many ports and harbours, but where new wharves or docks are being constructed, there seems to be no reason why they should not be considered as an alternative or addition to the methods now commonly used. There is also prejudice against subjecting coal to an extra handling in loading, on the score of the breakage involved. Whether such breakage exists in an extra process, provided proper precautions are taken, is a debatable point. The opinion of many mechanical handling engineers is that there is less breakage involved in double handling if a steady flow is obtained, than in the single process of dump-

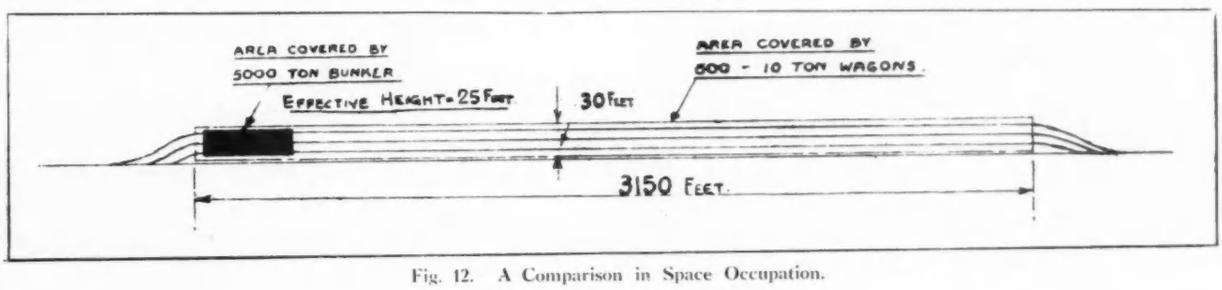


Fig. 12. A Comparison in Space Occupation.

Ropeways at Docks and Harbours—continued

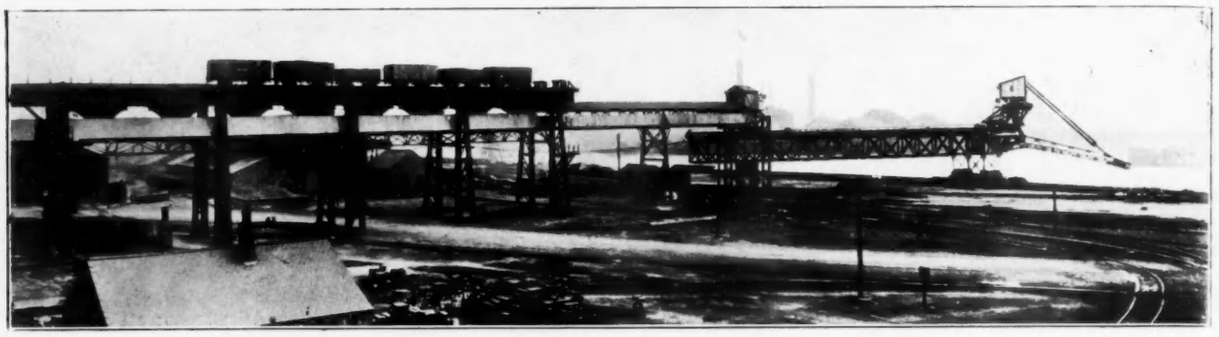


Fig. 13.

ing a mass of 10 or 20 tons of coal from an ordinary tippler directly into a ship's hold; certainly, to judge by the amount of dust created in the latter process, one would say that the former opinion is correct.

Loading plants comprising conveyors and hoppers filled by bottom discharge wagons have been in use of the north-east coast for many years (Fig. 13). The conveyors generally have an outrigged section capable of vertical and horizontal movement, fitted with an anti-breakage shoot. Loss due to breakage is, it is stated, less by this method than by adjoining tipplers of orthodox type. Costs are low, being only about ½d. per ton loaded, as against about 3d. per ton by tippler.

Substituting a ropeway for the railway from works or collieries would show an equally favourable reduction in the handling costs, even over distances up to 20 miles or so, notwithstanding which, the general tendency has hitherto been to consider a ropeway only after all other methods have been found wanting. Is it too much to hope that this tendency may in the future be reversed?

Acknowledgments and thanks are due to the following for photographs and details given in the preparation of this article:—The Editor of "The Engineer"; the Editor of "Colliery Engineering"; the British Ropeway Engineering Company, Limited; and Ropeways, Limited.

Port of Halifax, Nova Scotia

The "Triple Haven," known to-day as the City of Halifax, may have been visited even by Leif Eiriksson. Such is the tradition of Micmac story tellers. But until 1749, it was known as Chibucto, its ancient and expressive Indian title, meaning, "The Great Harbour." Not until 1841 was it incorporated as the Royal City of Halifax. This name, Halifax took from the old inland City of Halifax (Holy-Face) England. Haligonians believe the fact to-day, as did Joseph Douchette, marine surveyor, in 1832 when he reported Halifax to be "One of the finest harbours in America." A thousand vessels may ride in it in safety. It is accessible at all seasons of the year and easily approached.

To-day its population, including immediate suburbs and Dartmouth, is over 130,000. The ocean-going tonnage during 1940, in and out, was 36,589,076. It has eight piers and in 1940, 4,081 ships entered "the Great Harbour." Current war activity and rapidly increasing appreciation of the importance of Halifax

and its great harbour, point to a prosperous future for the Port of Halifax.

Between the years 1859 and 1862, the late Mr. H. I. Crandall designed and constructed three railway dry docks or slipways at Halifax, of 200, 800 and 1,600 tons lifting capacity, and in 1876, the latter one was enlarged and reconstructed for a capacity of 2,500 long tons, the largest constructed up to that time. The 200-ton dry dock was abandoned in 1930, while the other two are still in operation.

Alterations to New York Waterfront

A modification of the Harlem River waterfront at New York, U.S.A., is being effected between East 125th Street and Second Avenue, by eliminating the existing piers and marginal street, shifting the dock department bulkhead line and creating a new marginal street and basin. The cost is estimated at $1,566,500. Pier No. 32, East River is also to be reconstructed at a cost of $180,000. The work is being carried out under the Department of Docks, New York City.

River Transport of a Panama Lock Caisson

A floating caisson for use at the Panama Canal locks was recently transported by water from the Neville Island Yard of the Dravo Corporation at Pittsburgh to New Orleans, U.S.A. The construction of the caisson so far inland on a relatively shallow waterway presented certain awkward problems in getting the caisson to deep water in the Gulf of Mexico.

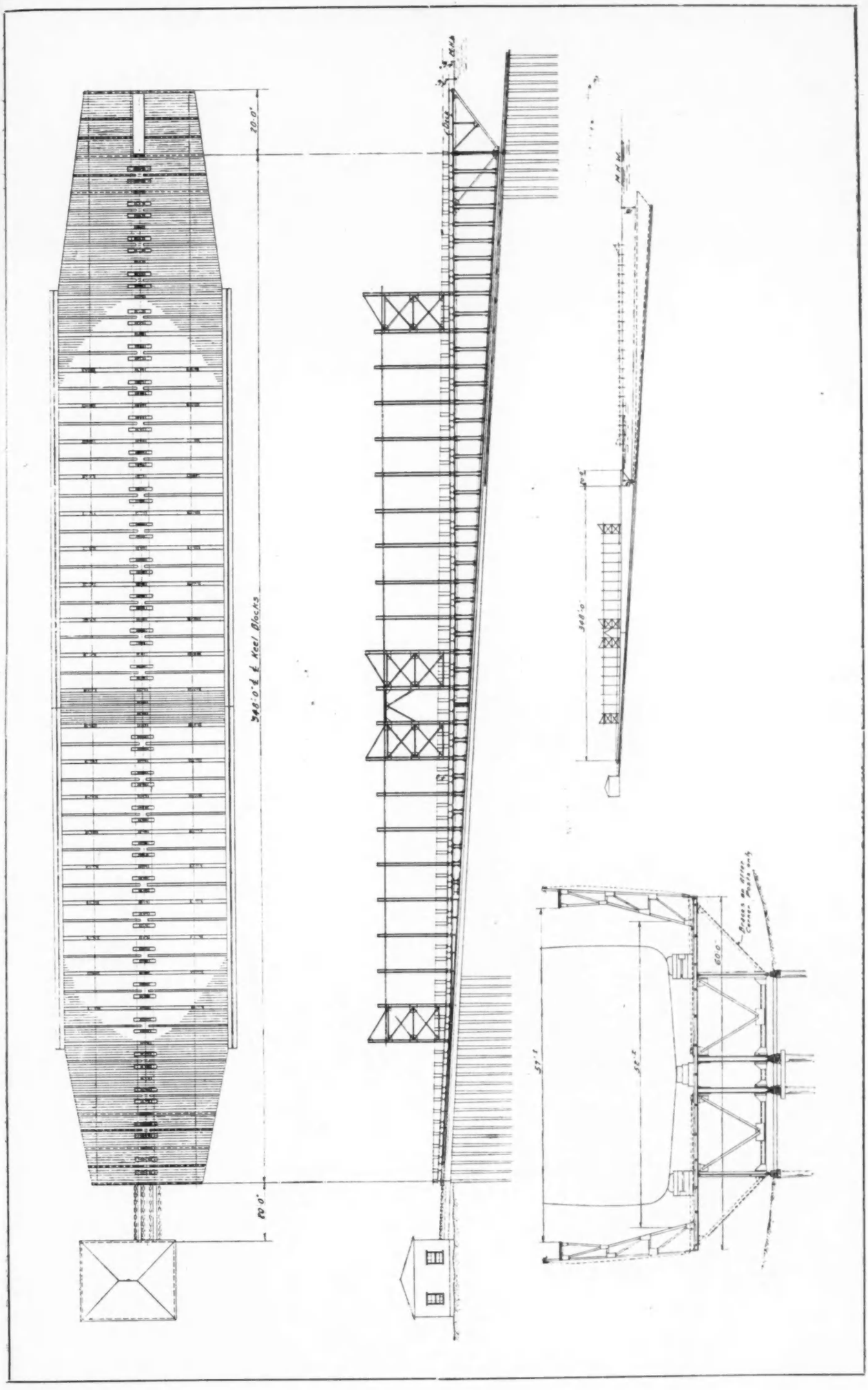
The caisson was designed by the Bureau of Yards and Docks of the United States Navy, and is intended to be floated into position at a lock entrance to permit the lock to be emptied for overhauling and repairing the gates and other parts of the structure. It is 113-ft. long, 32-ft. wide, and 65-ft. high, and, when light, has a draught of 32-ft. in salt water. When used to close the lock, efficient water ballast is added to give it a draught of 62-ft. 6-in. As the light draught of the caisson in the upright position would be far in excess of the 9-ft. channel depths in the Ohio and Mississippi Rivers from Pittsburgh to New Orleans, it was decided to float the caisson on its side as far as New Orleans, but preliminary calculations showed that when lying on its side, with the pumps and motors installed but without permanent ballast, its draught would range from 14-ft. 6-in. at the keel end to 6-ft. at the deck end. As the draught at the keel end was still too deep for the Ohio waterway, an arrangement was adopted by which the buoyancy of two petrol-driven barges was used to reduce the draught of the keel end of the caisson.

The caisson was built on its side. The structure is mostly of rivetted construction, and extensive use was made of cold riveting, because it is more economical for plates of considerable size and large rivets. Some of the heavy members such as the keel, however, were fabricated and attached by welding. The fenders, built of curved steel plates, also were welded on the outside shell. All outside surfaces received a coat of bituminous enamel.

The operational equipment of the caisson includes pumps for emptying its ballast tank or the lock chamber that it is used to close, motors, ventilating fans, deck cranes, anchor windlasses and capstans. The pumps and motors had to be installed on the ways during construction, but the deck equipment was not installed until the caisson reached New Orleans. The equipment is electrically driven, power being taken from the shore. All operating equipment was installed on a watertight main deck next to the upper deck.

Port of Limerick Finances.

Port revenues of Limerick have fallen off to such a degree that it was recently decided to call a special meeting of the Limerick Harbour Board to consider the position and the advisability of charging dues on small river craft. It is considered that such dues would bring in about £1,000. According to figures submitted at the meeting, the number of ships which entered the port in 1941 was 63 compared with 233 the previous year, and the total revenue was £6.277 against £16,907 for the previous year. Expenditure in 1941 was £13,735 as compared with £18,422 for the previous twelve months.


20'-0"
348'-0" E. Keel Blocks
20'-0"
348'-0"
60'-0"
57'-1"
52'-2"

Dock and Harbour Authorities' Association

Excerpts from the Twenty-second Report of the Executive Committee for the Year ended 31st December, 1941

The Committee have decided for various reasons connected with the war that their Annual Report should be confined to a list enumerating the various matters considered during the past year, and members are asked to write to the Secretary should they wish to have full information of matters listed in which they are interested.

Annual Meeting

Members are asked to note that authority is being sought, again for war reasons, to dispense with the Annual Meeting in 1942, which by Rule 5 of the Constitution and Rules should be held in January or February, and that approval for the formal Resolutions which form the business of the Annual Meeting, and which are set out in that Rule, should be obtained through the medium of the post.

Obituary

The Committee record with great regret the following deaths during the year:

Sir Richard D. Holt, Bart., whose death occurred shortly after the last Annual Meeting. He had been Chairman of the Executive Committee of the Association in 1928 and 1929, Vice-president 1931-1934 and 1939-1941, and President from 1935 to 1938.

Mr. A. Blacklock (late General Manager and Secretary, Tyne Improvement Commission), a Member of the Executive Committee 1936 to 1940).

Sir David Owen (late General Manager, Port of London Authority), Member of the Executive Committee 1928 to 1938.

Mr. E. A. Moorhouse (Solicitor, Mersey Docks and Harbour Board), a Member of a number of Sub-Committees of the Association for many years.

Honours

The Committee were gratified at the honour of Knighthood conferred upon Sir Douglas Ritchie (General Manager, Port of London Authority) in June, and also at the appointment of Sir Douglas as a Member of the new War Transport Council which was set up last April to advise the Minister on questions of Transport Policy.

It is noted with pleasure that Sir Lionel A. P. Warner, who retired from his position as General Manager and Secretary of the Mersey Docks and Harbour Board in July, and has represented Harbours and Docks (other than those railway-owned or railway-controlled) on the Transport Advisory Council set up by the Road and Rail Traffic Act, 1933, is continuing his service on the Council at the request of the Minister and this Association.

Executive Committee

The Committee, on the retirement last February of Lord Ritchie of Dundee, who had held the office of Chairman since 1930, appointed Colonel J. G. B. Beazley (Mersey Docks and Harbour Board) as their Chairman.

Sir Lionel Warner was subsequently appointed to represent Liverpool and the N.W. District of England on the Executive Committee.

Association's Trustees.

The Committee appointed Sir Douglas Ritchie, Mr. R. J. Hodges and Mr. Leslie Roberts as Trustees of the Association in accordance with Rule 13 of the Constitution of Rules, to take the places of Sir Lionel Warner, who has relinquished the office, and the late Sir David Owen and Mr. F. A. Eyre.

Membership

The Association in 1941 comprised 61 Authorities; the following having joined during the year:

Blyth Harbour Commission.
Warkworth Harbour Commission.
Cowes Harbour Commission.
Ramsgate, Port of.
Larne Harbour Limited.

The present number of Members exceeds that of any previous year.

List of Matters Dealt With

The matters which received attention during the year include the following:

Allied Powers (Maritime Courts) Act.
Arrangement with the Government, 1920, for payment of dues on ships and goods—
(a) Questions of difficulty for discussion by the Government Traffic (Dock Charges) Committee to which Association's representatives have been appointed (Circular No. 534).
(b) Cased petrol shipped for War Office—dues on ship and cargo.
(c) Application of Arrangement to H.M. Vessels—Measurements.
(d) Naval Vessels—Graving Dock Rates.
(e) Set off by Admiralty of Dues in consideration of construction of works—para. 4 of Arrangement.
(f) Basic dues and tolls on ammunition.
(g) Scrap metal if used for commercial purposes—no rebate.
(h) Rebates on ships requisitioned or released from requisition.
(i) Dues on ships carrying mixed cargoes.
(j) Port rates on meat for Service Departments.

British Standards Institution—
(a) Committee on Cranes and Derricks.
(b) Lighting of Docks and Shipyards—B.S. Specification for Lighting Fittings (Circular No. 513).

Canteens in Dock Industry—Docks (Provision of Canteens) Order 1941 (S.R. & O. 1941, No. 222) (Circular No. 511).
Catchment Board—Hampshire Rivers.
Cold Stores Control by Ministry of Food—Cold Storage (Control of Undertakings) Order 1941 (S.R. & O. 1941, No. 37).
Consumer Rationing Order, 1941 (S.R. & O. 1941, No. 701).
Control of Building and Civil Engineering Contracting (Circular No. 532).
Decontamination of Ships and Cargoes.
Decorations for Gallantry—Dock and Harbour Employees.
Docks and Harbours—Protected Places.
Docks and Harbours—Increase of rates and charges.
Dues on embarkation and disembarkation of allied troops.
Dues on vessels entering ports to join convoys or take shelter.
Emergency stacking of Government coal—Charges.
Essential Works (General Provisions) Order, 1941 (S.R. & O. 1941, No. 302).
Explosives, discharge of—Port and Transit Control.
Factories Act, 1937. Examination of Plant (Circular No. 531).
Factories—Chief Inspector's Report.
Finance Act, 1941.
Foodstuffs contaminated by poison gas—Treatment and disposal.
Goods damaged as a result of enemy action, requisitioned by Ministry of Supply. Authority's lien.
Inland Sorting Depots.
Mills and Factories Allowance—Section 15, Finance Act, 1937.
National Service Acts—Dock Police.
Personal Injuries (Civilians) Scheme (S.R. & O. 1941, No. 226) (Circular No. 519).
Pilferage at Docks (Circular No. 539).
Port Emergency Committees—Expenses.
Post-war Dock and Harbour Civil Engineering Works.
Public Utility Undertakings—Publication of Accounts (S.R. & O. 1941, No. 452) (Circular No. 516).
Requisitioning of Property of Dock and Harbour Authorities.
Safety of Seamen in Ports (Circular No. 537).
Schedule of Reserved Occupations (Circular No. 526).
Thomas Grey Memorial Prizes.
Tugs—
(a) Arrangement for keeping up steam.
(b) Danger Money.

Transfers and Securities of Companies made available for salvage—Emergency Powers (Defence) Regulations (S.R. & O. 1941, No. 1778).
War Damage—
(a) War Damage Act, 1941 (Circulars Nos. 514, 524, 529, 538, 540).
(b) War Damage (Business Scheme) Order 1941 (S.R. & O. 1941, No. 450) (Circulars Nos. 515 and 520).
(c) Proposed legislation for Public Utility Undertakings (Circulars Nos. 517, 518, 520, 521, 522, 523, 524, 535 and 536).
(d) Notification and Claims Regulations (S.R. & O. 1941) (No. 569).
(e) Leased Properties and short tenancies.

War Gifts from Overseas—Concession in Charges.
Wreck-raising—
(a) Arrangement with the Admiralty and Ministry of War Transport (Circular No. 533).
(b) Dock and Harbour Undertakings (Control of Wrecks and other Obstructions) Order, 1941.

Wrecks, marking of.

Accounts

The Expenditure charged to this year's accounts amounts to £2,490 18s. 5d. of which £2,488 6s. 10d. is payable by Members, the excess of Expenditure over income amounts to £477 18s. 10d.

This deficit is caused by the decrease in the amount of subscriptions received as compared with those for the year 1940.

The Report is signed by Colonel J. G. B. Beazley, Chairman, and Mr. W. Ashley Cummins, Secretary.

Dock Labour Scheme for North-Eastern Ports

In connection with the Dock Labour Scheme for the Tees and the Hartlepools, a local board has been appointed with a manager, by the National Dock Labour Corporation.

The chairman is Mr. K. P. Walker, who is also chairman of Middlesbrough Port Emergency Committee, the other members being Mr. W. P. Allen (chairman of the Hartlepools Port Emergency Committee), Mr. J. R. Milne (wharf manager, Dorman, Long & Co., Ltd., South Bank Wharf), Mr. A. A. Harvent (Master Stevedore, Middlesbrough Dock), Mr. R. Wilkinson (district secretary, Transport and General Workers' Union, Middlesbrough), Mr. H. J. Edwards (president of the Transport and General Workers' Union), and Councillor J. Middleton (area secretary, National Union of Municipal and General Workers at the Hartlepools. The manager is Mr. F. J. Rand, who has had long experience of port work in London, where he occupied a number of important posts with the Port of London Authority.

*Costing in Relation to Port Operation**

By GILBERT WILSON, A.M.Inst.T.†

(Concluded from page 85)

To Prepare Information from which the Management may fix a Satisfactory Scale of Charges

The ports of Great Britain are regarded as national assets rather than commercial undertakings. Nevertheless, they have one characteristic in common with profit-making concerns and with each other; they must endeavour to make income exceed expenditure.

The greater part of port revenue is derived from dues and charges. Dues are levied on register tonnage and goods entering the port, and are generally regarded as payments for accommodation provided, and applied to the maintenance of the dock works. With dues the cost office will have little to do.

Charges for services in respect of goods lie in a different category. Such charges must cover the cost of performing the service plus a proportion of the establishment costs of the undertaking, and must also include a sum, conveniently referred to as profit, which will be applied to the payment of interest, dividends, contributions to sinking funds and reserves.

The fixing of charges is a matter for the management. We have seen, however, that charges must be based on a firm foundation of cost, and it is the duty of the cost office to supply the management with detailed information of costs for their guidance. Where services are performed before the charges are quoted, this is a simple matter, but where charges are agreed before the service is performed, cost will necessarily be an estimated figure computed from whatever reliable data is available.

The need for reasonable accuracy is obvious. An over-estimate will increase the amount of the quotation and may result in the loss of traffic to some competitive route, while an under-estimate will reduce or even wipe out the profit on the job. Although infallibility is not to be expected, the margin of error in a properly organised cost office should be small.

It must be emphasised, however, that no costing system will solve all a manager's problems in advance. Costing is merely a valuable aid to his judgment. The management may decide to cut profits in order to secure new traffic or stimulate a declining branch of trade; and two ports serving the same hinterland will probably be forced to compete for traffic by reducing profits to a minimum. In any case the downward limit of rate-cutting must eventually be reached. Without a proper costing system it would be possible by unknowingly quoting unremunerative rates, to secure traffic and yet be in a worse financial position than before. Such lack of method is doubly to be condemned, since it brings no reward to him who secures the traffic, and, by leading the customer to under-estimate what is a reasonable price for the service, spoils the field for his competitors.

To Detect Inefficiency and Waste

While actual control of the operating staff must rest with the management, the cost accountant is in better position than anyone to gauge the relative efficiency of different handling methods. For his purpose an efficient method is one which produces a fair margin of profit and, other things being equal, the management will generally be of the same opinion.

The cost accountant must therefore keep a watchful eye on all handling operations from the point of view of cost, and bring to the notice of the management all instances where an expensive or unprofitable method has been used when a cheaper alternative was available.

Idle Overhead.—The relation between the volume of traffic and expenditure is another matter which he must devote close attention. It is an elementary rule of costing that an increase or decrease in the volume of traffic does not bring about a proportionate increase or decrease in the total cost. The explanation of this variation is found in the volume of unused productive capacity, or "idle overhead," and the cost accountant must watch very carefully the relative proportions of "idle" and "operating" costs which go to make up his total. With the developing mechanisation of cargo handling at ports, idle overhead tends to increase.

A manufacturer may ensure the fullest use of his plant during slack periods by producing in advance of demand, but the port authority must take traffic as it comes. If traffic is to be attracted and demurrage charges avoided, the port's equipment must be adequate to cope with the peak load; consequently, any falling off in trade will render plant idle and burden the undertaking with expensive overhead charges. Moreover, a machine thrown out of commission during a temporary decline in traffic will take its crew into idleness with it. Such men will be skilled operatives, and although a number of them may be absorbed into useful maintenance work, it is almost inevitable that the costs for the slack period will be swollen by an unduly large figure for "cleaning and adjusting machines."

Delays during work have an important effect upon costs, and should be periodically analysed under their respective causes—breakdowns, changing jobs, bad weather, waiting for cargo, etc.—and the attention of the management drawn to any excessive or unreasonable stoppages.

Cost Accountant as Adviser.—It is not outside the cost accountant's province to suggest economies that in his opinion could be made; indeed, his knowledge of traffic working added to the detailed information as to costs which his staff prepares will especially equip him to do so. He must also keep abreast of matters of policy and draw attention to the effect upon costs of any alteration therein, both before the event, in the form of an estimate, and in actual figures as soon as possible afterwards. The effect of such matters as alterations in rates of pay to workers and the relative proportions of permanent and casual employees, should especially concern him. Since 1914 there have been no less than twenty separate alterations in the standard wage of dock workers. Before 1914 the standard rate of pay for a casual time-worker at one of the greater ports was 7d. per hour; it reached 2s. per hour under the Shaw Award of 1929; and is to-day (1941) 1s. 10½d. These fluctuations have had a greater or less effect upon the costs according to the proportion of labour cost to total cost. They have also affected the fairness of any comparison of the costs of one period with those of another during which the rate of pay was not the same. In making such comparisons the respective rates of pay must be borne in mind and allowance made for any variation.

Decasualisation.—Decasualisation and its effect upon the pay roll will be prominent in the cost accountant's mind. In the agreement of August 17th, 1937, between the National Council of Port Labour Employers and the Unions, the parties undertook "to confer jointly forthwith, both nationally and locally, in order to give effect to a scheme for the greatest possible measure of decasualisation of labour in the ports." While this study is no vehicle for the discussion of the ethics of casual dock labour, it must be admitted that from the employers' point of view, it has probably been an advantage to have available a body of unskilled or semi-skilled labour to call upon as the exigencies of trade demand. Any measure of decasualisation, if decided upon, will affect an employer's wage bill, and possibly his overhead costs as well.

The cost accountant should therefore prepare estimates of the financial effect of any proposals for decasualisation in so far as they affect costs, so that the management may be guided in their decisions.

To Supply Detailed Information to the Financial Accountant

The purpose of the general accounting system is to ascertain the total profit and loss on the undertaking as a whole. The costing system carries the detail of expenditure to a much higher degree of analysis in order to ascertain the cost of any given operation. The two systems, however, are closely inter-connected and must be capable of exact reconciliation at any time.

The costing staff, in extracting data for costing purposes, have necessarily to collect all items of expenditure—wages, invoices, power and stores—into a form whence they can be assigned to their respective departments. This allocation is actually the first stage towards the preparation of the periodical revenue statements by the financial accountant.

At the end of every accounting period the cost accounts will include items of expenditure on jobs which are commenced in one period and completed in the next. Where it is the practice to treat jobs as a whole, the entire job may be assigned to one period or the other, generally to that which bears the greater part of the expenditure. The necessary adjustments are made by means of a suspense account. If, on the other hand, it is desired to confine expenditure to items incurred during each accounting period, the suspense account is used to debit the completed portion of any work in progress with its due proportion of overheads.

By this means the financial accountant is enabled to make up accurate revenue statements on the working of any period.

In most large undertakings it is the practice for the financial accountant to prepare, towards the end of the financial year, an estimate of probable revenue and expenditure for the ensuing year. The cost office can render him valuable assistance in this task. Information relating to every type of operation and every class of traffic finds its way to the cost office, where it is recorded and summarised. The cost accountant is therefore most favourably situated as regards estimating the effect of any changes in trade upon the financial accounts.

The Cost Office as a Statistical Department

The cost office may be regarded as a clearing-house for statistical returns. Many of these will be passed on to other departments; others, particularly those relating to handling of cargo, will be analysed and summarised, and the result presented in a readily comprehensible form. By this means the management can be kept informed of many important matters which would otherwise escape their notice.

*Reproduced by permission from the October, 1941, issue of the Journal of the Institute of Transport.

†Port of Bristol Authority.

Costing in Relation to Port Operations—continued

The output per day and per working hour of elevators, cranes, hoists, and other mechanical appliances; output per man-hour where labour is paid at time-work rates; the relative proportions of traffic handled by manual labour and machinery; the division of working time between operating and non-operating time with an analysis of delays under causes; and costs relating to every branch of trade, are all matters which should be presented regularly to the management.

Statistics relating to the working of the dock railways must also be regularly compiled. At those non-railway-owned docks where the port authority maintains its own internal railway service to link up the wharves with the main lines, a close watch on such matters as the number of wagons hauled per engine-hour and the overall cost per ton of hauling over the dock line is essential.

Busy directors and managers should not be required to spend valuable time in studying lengthy statements containing masses of statistics. Graphs and charts, made on cross-section paper, will be found invaluable for supplying them with costing and statistical data in a form in which it can be read and understood at a glance.

In the foregoing pages it has been possible to give only the outlines of a costing system which could be introduced in an undertaking performing cargo-handling operations. To deal with the subject adequately would require a much lengthier work; but it is hoped that the need for a costing staff in this branch of operating no less than in manufacturing industry has been demonstrated in the present study. The size and organisation of such a staff will of course be determined by the size and nature of the undertaking; but it will be found that a properly organised cost office will soon justify its existence. The manager knows from his accountant's figures whether he is making a profit or a loss. It is the business of the cost office to tell him why.

The River St. Lawrence Ship Channel

*Excerpts from Report on Operations during Year ended 31st March, 1941**

Construction

The 35-ft. Improvement Project was continued, all work being done under contract. This project consists in the widening of the more important curves to a minimum of 700-ft., and the widening of certain tangents from 450-ft. to 550-ft., all to a depth of 35-ft. at extreme low water of 1934. It also includes the realignment of certain portions of the Ship Channel where this may be done in the interest of safe navigation, as well as economy in dredging; this applies particularly to the rock section at Cap a la Roche and the new channel at Three Rivers.

Dredging operations were in progress throughout the season from May 1 to December 1, during which time eight dredges of various types and capacities were employed for varying periods in the removal of 2,357,631 cub. yds. of all classes of material.

Lake St. Peter.—Improvement of the channel through Lake St. Peter has been under way since 1933. During the past season 2 dredges were engaged on the widening and deepening of the remaining sections, and the whole area is now approximately 95 per cent completed. Dredging was in progress from May 10 to July 5, for a total of 101 nominal working days, during which time 811,233 cub. yds. of clay and sand were removed.

Three Rivers, South Channel.—This work was begun in 1937 for the purpose of relieving the hazard to shipping while moored at the docks of Three Rivers caused by the passing of through traffic close to these docks. Cleaning of the channel was completed during the season by one dredge, operating from September 18, a total of 14 nominal working days; 1,000 cub. yds. of clay, stones and boulders were removed. It is expected that this new channel may be opened for traffic early next season.

Cap a la Roche Curve.—Improvement of this area by widening was begun during the season. Strong currents, together with shallow water over rocky banks on each side, have combined to make the channel at this point difficult for navigation. One rock drill and 4 dredges were employed on the work from June 1 to November 28, a total of 271 nominal working days, during which 260,405 cub. yds. of shale rock, clay and stones were removed. The work in this area is approximately 35 per cent completed.

Cap Charles Channel.—This area adjoins that of Cap a la Roche and similar difficulties of navigation existed. The former channel had a width of 450-ft.; this is now being widened to 550-ft. The work was carried out by 2 dredges from May 22 to November 18, a period of 60 nominal working days and 99,324 cub. yds. of shale rock, hardpan and stones were removed. The work was completed except for a small amount of cleaning. The additional width will be available in 1941.

Cap Charles Curve.—This curve has been widened from 500-ft. to 800-ft. Only a small amount of cleaning was done this season, and it was opened for navigation. It is expected that the entire area will be cleaned up in the coming season.

Maintenance

The usual maintenance work was carried out, including the dredging of sand filling areas, and the removal of boulders from previously dredged areas.

Sweeping was carried out in those dredged areas where change of depth might be expected, in addition to the usual reconaissance sweeping throughout the dredged channel.

In the Saguenay district, a thorough examination was made by sweeping of the entire dredged channel from St. Fulgence to Chicoutimi—as a result the limiting depth remains at 14-ft. at low water.

The river level remained close to the average throughout the season, varying at Sorel from a high of 38.9-ft. in April to a low of 31.1ft. in October above zero or extreme low water of 1897, while in the upper harbour of Montreal a low level of 29.2-ft. in October and November was reached.

Signal Service

All of the 42 reporting and signal stations under the jurisdiction of the St. Lawrence Ship Channel Branch were continued in operation throughout the season of navigation. As a war measure this service has been in close co-operation with the Naval Service.

Opening 1941.—During the winter, ice conditions were severe, the river remaining open to Three Rivers with comparatively few jams at the Bridge which required attention.

A new icebreaker, *Ernest Lapointe*, was placed in commission on February 20 and proceeded to Three Rivers ready to assist in the opening of the channel to Montreal. This new ship is of 1,179 tons gross; length 172 B.P.; beam 36-ft. and depth 24-ft.; twin screw, oil burning, and 2,000 H.P. It was built by the Davie Shipbuilding Repair Company at Lauzon, Quebec, along somewhat similar lines to those of the *McLean* and *Saurel* to replace the *Lady Grey* which has been in continuous service since 1906.

The opening operations began at Three Rivers on February 25 with the *McLean* and *Lapointe*. Montreal East was reached on March 13, with icebreaking conditions in this area somewhat better than usual; although the surface ice was from 22 to 28-in. in thickness there was on the average less frazil, and the river level was somewhat higher. The *Saurel* joined in the operations on March 18, and the channel was opened to Victoria Pier, March 29.

The river was practically free of ice on April 14, the first vessel arriving at Montreal, April 18.

*By Mr. J. L. St. Laurent, Chief Engineer. Extracted from Annual Report of Canadian Department of Transport, Ottawa.

Canalisation of the Neckar.

The extension and canalisation of the River Neckar for ships of up to 1,200 tons, which, when completed, will create a link between Rhine and Danube has, it appears from an official report, made only slight progress since the beginning of the war. The first section, which covers 113 kilometres, was completed in 1935; of the second and final section of 89 kilometres, which is also being built by the Neckar A.G., approximately half is now finished, but the locks have not all been installed. When the second section has been completed, the manufacturing district of Wurttemberg will have a direct water connection with the North Sea. The linking-up of the Rhine and Danube will involve further extensive work.

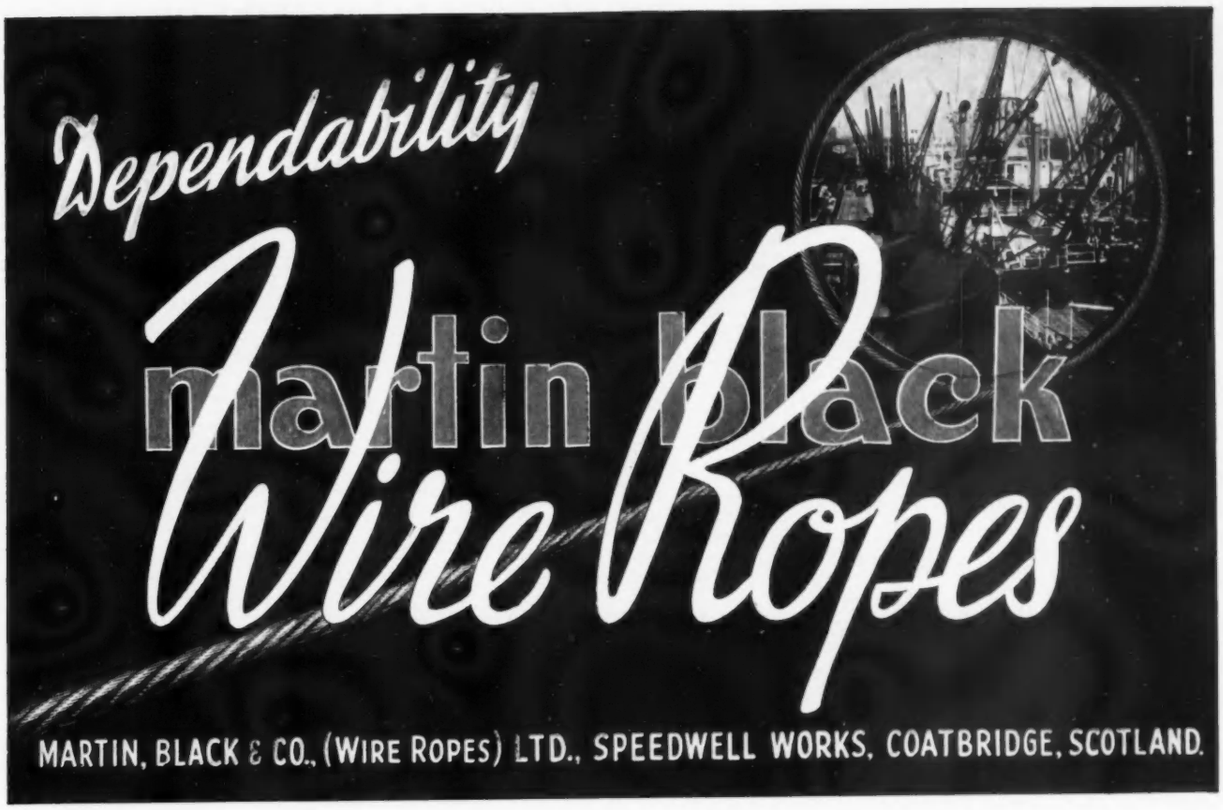
Tyne-Wear Local Dock Labour Board.

A Local Dock Labour Board has been constituted for ports in the region of the Tyne and Wear. The chairman is Mr. N. M. Hood, General Manager of the Tyne Improvement Commission. Other members are Mr. W. Short (Tyne and District Master Stevedores); Mr. J. N. Burrell (Tyne-Tees Shipping Co.); Mr. A. J. Clarkson (Traffic Manager, Tyne Improvement Commission); with Messrs. J. Tarbit, W. Kitching, G. Shields and F. Pearson, representing the National Union of General and Municipal Workers, the local union of the docks workers. The manager is Mr. J. M. Atkinson, who will also act in that capacity for the Cumberland ports when they come into the general scheme.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this Journal should not be taken as an indication that they are necessarily available for export.

FOR SALE.

HIGH PRESSURE REAVELL COMPRESSOR, 2/stage Belt-driven 100 cubic ft. per minute at 250 pounds per square inch. Write Box 101, "The Dock and Harbour Authority," 19, Harcourt Street, London, W.1.



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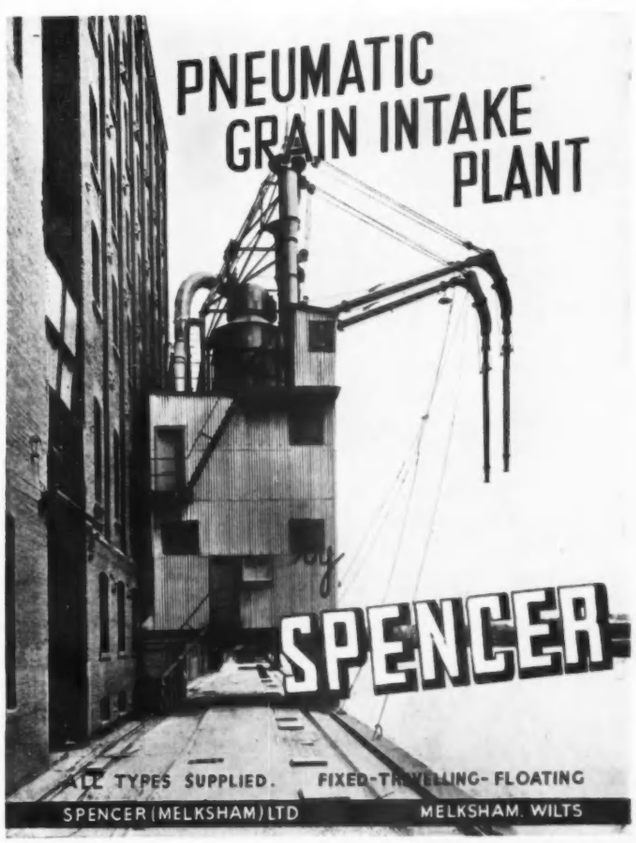

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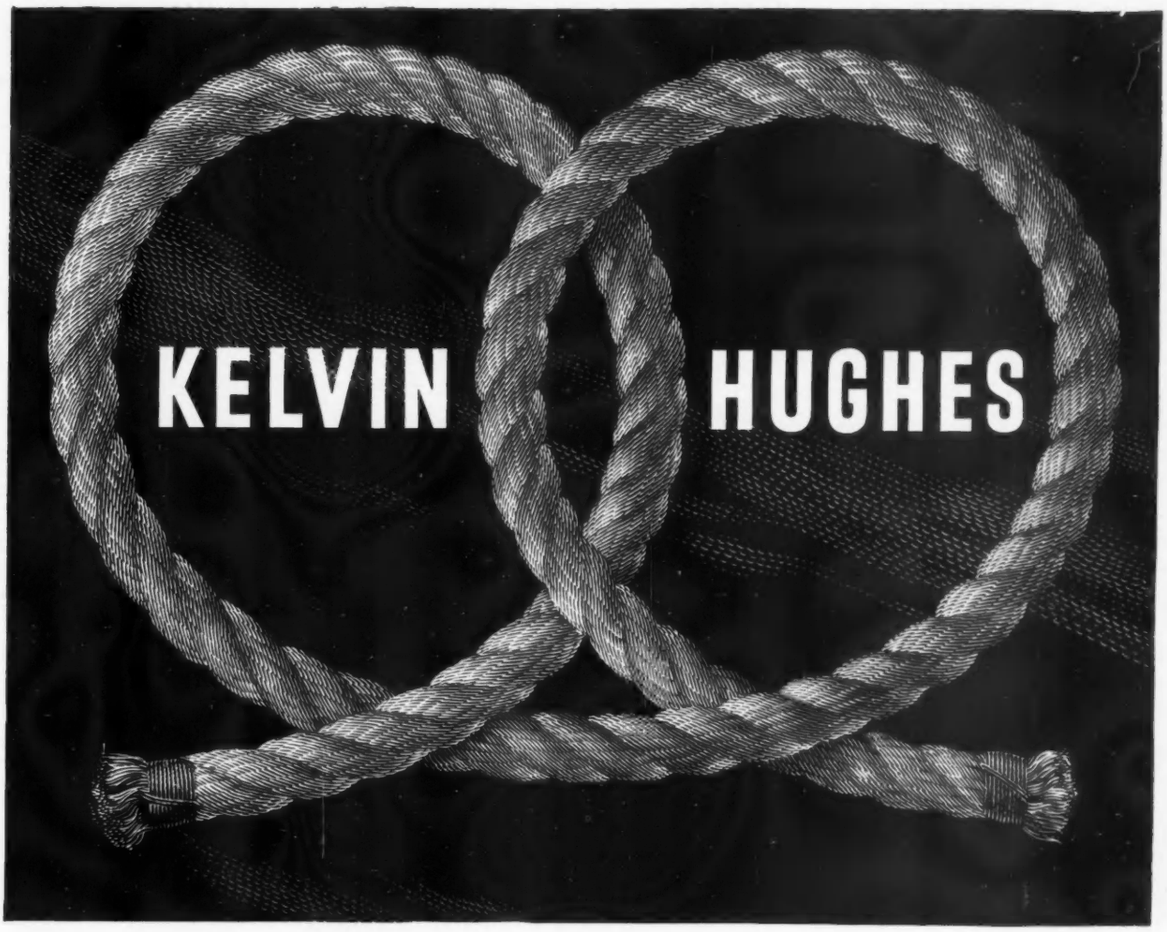

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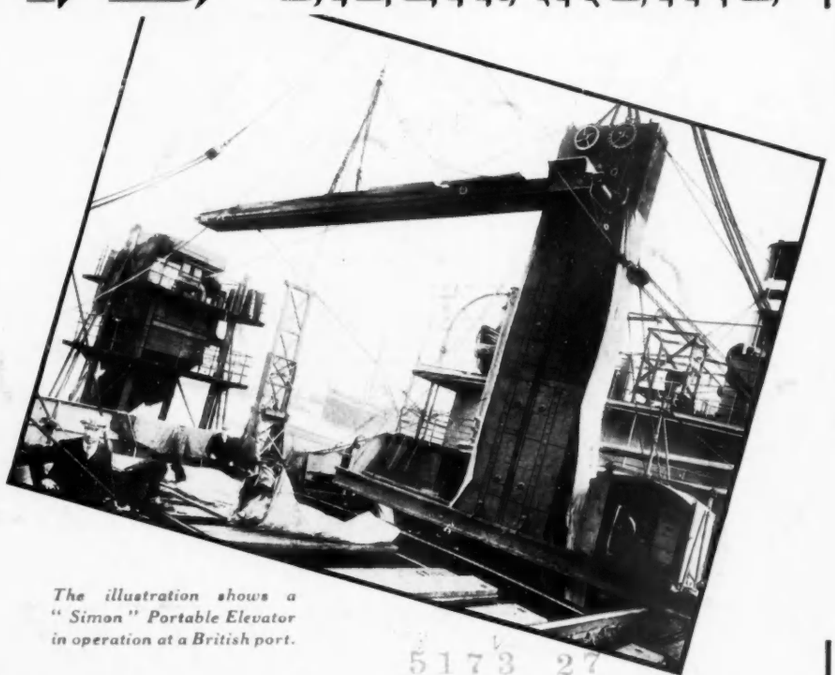

The illustration shows a "Simon" Portable Elevator in operation at a British port.

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